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OFFICIAL RECORDS OF BUSINESS IMPROVEMENT.

With the inauguration of a new president and the promise of four years of sane and conservative government on the part of the Republican Administration, attention is focused on the present condition of affairs as compared with the business situation a year ago. Of course it can be said offhand that interests are looking up and that there is every promise that we are in a period of renewed prosperity, and that we shall shortly be so busily engaged that the gloom of the past twelve months will be dispelled.

The press of the country has been actively engaged in indicating considerable improvement in every phase of industry, and it is indeed unfortunate that just at this time there has been a slight recurrence of panicky conditions in financial centres, but this was brought about mainly by a disposition on the part of large interests to increase activities along specific lines, and the tumble in the steel stocks does not indicate, it is believed, that any very general readjustment is due or necessary.

As an earnest of the really improved conditions, official records which have been compiled by the Bureau of Statistics of the Department of Commerce and Labor offer considerable encouragement. It is shown that the importation of india rubber was two-and-one-half times as great in December, 1908, as in December, 1907. This being the fact, it may be assumed that the numerous industries which utilize india rubber in their various lines of manufacture are much busier than they were a year ago. It may seem an aside to refer to it here, but these statistics also show that the importation of diamonds and other precious stones for December, 1908, was six times as great as in December, 1907. This is quoted only to indicate that if these statistics be true, people are spending more money than they did a year ago, and with the lessons of economy which have been so bitterly learned well in mind, and the care with which credit is being considered, it seems reasonable to assume that the people have the money to spend.

Compared with a year ago, traffic movements and building in some sixty principal cities of the country show marked improvements. Records of importations show that crude food stuffs which amounted to sixteen-and-three-quarter millions in December, 1906, had fallen to eleven millions in December, 1907, and returned to fourteen-and-one-half millions in December, 1908. Crude materials for use in manufacturing amounted to forty-five-and-one-half millions in December, 1906, twenty-eight millions in December, 1907, and had returned to forty-one millions in December.

MAXIMUM ECONOMY IN GAS-ENGINE PLANTS.

In operating a modern gas-engine plant, one of the most important points to bear in mind is that while low fuel consumption is desirable, the other factors in the station cost cannot be neglected with safety, if high efficiency of service is to be constantly maintained. It is only natural that great emphasis should be laid upon the ability of a well-designed gas-engine plant of even a few hundred kilowatts capacity to turn out energy at a fuel cost better than can be met by a steam station of from ten to twenty times the former's size. To shut one's eyes to the effect of the load factor on the labor cost, however, or to overlook the effect of inferior inspection and unskilled adjustment on the maintenance expenses, is to miss the broadest opportunity to control the installation along the best lines of present practice.

The ability of the gas-engine plant to produce electricity on a low coal consumption per kilowatt-hour of output is illustrated by the records of a 1,000-horsepower station for two recent months. In the first month the plant generated current on 2.285 pounds of coal per kilowatt-hour, and the total energy output was about 80,000 kilowatt-hours. At a coal cost of $3.97 per ton the fuel expense per kilowatt-hour came to 0.40 cent.

The labor cost was 0.80 cent, and the total cost of manufacture 1.885 cents, exclusive of any fixed charges. Fuel and all supplies were 1.08 cents per kilowatt-hour. These figures are not of interest as exhibiting low-unit cost of energy production, for many a steam plant of moderate size when run condensing, with compound engines and coal costing even $4.25 per ton, has been able to generate its kilowatt-hour unit at close to 1.3 cents. As it happened, the load conditions at this plant were unfavorable to the operation of the machinery at a good sustained output somewhere near the normal rating of the equipment.

In the second month the load fell off so much that the plant only turned out approximately 28,500 kilowatt-hours. With such a drop it would be folly to expect to make a good showing, but in the matter of fuel consumption the plant did remarkably well and showed a relatively small decrease of efficiency. The coal consumption per kilowatt-hour increased to 2.344 pounds, and the cost per ton remained nearly the same as before. As a result the fuel cost per kilowatt-hour for the second month's operation was 0.42 cent, which speaks well for the handling of the station under the handicap of an output cut down almost two-thirds. Few steam plants could do as well with a drop of twenty-five per cent in output. The cost of supplies per kilowatt-hour, however, rose to 2.89 cents, and the wages cost jumped to 2.23 cents per kilowatt-hour, giving a total cost of 2.34 cents for manufacturing. The lesson of this is clearly that no plant can expect to overcome the effect of a wretched load factor by fuel economy alone, and that low labor and miscellaneous costs per unit demand large and well-maintained power loads in proportion to the normal capacity of the machines in service. Conditions being equal, on the basis outlined above the gas engine economy seems assured.

TUNGSTEN STREET LAMPS VERSUS ARCS.

Some central stations and the cities and towns served are finding it for their mutual advantage to substitute tungsten lamps for electric arcs on the streets.

Even where there is no increase in the rate of compensation per mile of streets, it is suggested that such a change usually means a decrease of operating expenses for the electric company, and better distributed light, if not more light, for the municipality.

In a recent case, a city with fifty-two alternating arc lamps of the 6.6-ampere type on its streets agreed with the lighting company for the substitution of five tungsten lamps of sixty candlepower for each arc. Besides the arc lamps, this city had some 265 carbon incandescent lamps rated at twenty-five candlepower each on its streets, and these were replaced with an equal number of forty-candlepower tungsten lamps.

No change was made in the rates for street lighting, each forty-candle tungsten being furnished at the same price as a twenty-five-candle carbon lamp, and five of the sixty-candle tungsten lamps being billed at the price of one arc. In consideration of the substitution of the tungsten lamps, however, the lighting contract was extended to a date three years later than it would otherwise have expired.

As to the amount of load, the electric station gained by the change, both on the arc and on the carbon incandescent lamps. If operated as low as 400 watts each, the fifty-two arc lamps required 20.8 kilowatts, while the 260 tungsten lamps of seventy-five watts each substituted for them consume 19.5 kilowatts. For the 265 carbon incandescent lamps the output must have been 23.3 kilowatts, assuming eighty-eight watts each, while an equal number of forty-candle, fifty-watt tungsten lamps requires only 13.2 kilowatts. So the load is reduced fully eleven kilowatts.

On the score of maintenance, the 260 tungsten lamps will be less a burden than the fifty-two arcs that they replace, but it is not clear that the longer life of the forty-candle tungsten lamps will fully offset the lower price of the carbon filaments.

Bids recently taken for street lighting in a rather large city, where 6.25-ampere alternating arc lamps are now in use, contain an option of $17 per lamp per year for 125-watt tungsten lamps, or $30 per lamp per year for 250-watt tungsten lamps, or $56 per lamp per year for the above arcs, all on the basis of overhead lines and a contract for five years.

Assuming that each arc lamp in the bid just noted requires 400 watts, the rate of $56 amounts to $140 per kilowatt-year, while the rate of $30 for the 250-watt tungsten lamp represents $120 per kilowatt-year. These rates must be considered in connection with the fact that the alternating arc lamps are already in position, and must be removed and sold at a loss if the bid for tungsten lamps is accepted.

Under these conditions the bid is less per kilowatt-year for the tungsten than for the arc lamps. Obviously, the company must regain its lost capital, if the change to tungsten lamps is made, through lower cost of maintenance.

If current for operating the alternating arcs is figured at ten cents per kilowatt-hour, including trimming and care of the

lamps, the charge for a 400-watt alternating arc is four cents per hour of operation; trimming and maintenance of the lamp may amount to one-half cent per hour out of this sum.

For the 200-candle, 250-watt tungsten lamp the cost of current at the same rate is 2.5 cents per hour of burning, and the lamp renewals will probably amount to more than one-half cent per lamp-hour. If these lamp renewals just offset the trimming and maintenance of an arc, the difference in favor of the 250-watt tungsten is put down at 1.5 cents per hour.

These figures work out too closely to indicate any conclusive evidence that one system is better than the other, and in determining upon a proper unit to use other factors are easily introduced which entirely outweigh the matter of apparent first costs and even apparent savings in maintenance. There are localities which require a certain amount of illumination, and for these the arc lamp is the thing and the incandescent would never do. The same statement may be accepted as true reversed. The enthusiast for the incandescent lamp will figure out a better proposition than can be secured with the arc lamp for most any case, while on the other hand competent engineers and withal the manufacturers of arc lamps are confident that the incandescent, while it will occupy a continually enlarging sphere of usefulness in street lighting, that the demonstrated adaptability and utility of the arc lamp will maintain its sales and make its manufacture a matter of profit.

BUY NOW.

The peculiar economic conditions coincident with the effort trade in general is making to establish a stable market is not without its advantages to the fortunate buyer who is possessed of ready money or whose credit is such that this easily stands in lieu of cash in hand.

For a considerable period manufactured products have been wrought with a minimum of expense, and raw material has been gathered together at low cost, so that prices, all things being considered, are low in many lines of materials which enter into engineering construction.

The cut in steel prices has been sounded around the world. Material reductions have been made in other metals, and the copper market is remarkably open, with low prices prevailing. Anticipating tariff changes, other lines of both manufactured products and raw materials are selling considerably under the usual quotations.

From authentic sources it is learned that the pole and tie industry has not presented in years a more favorable opportunity for the buyer than at present. Stocks of the finest timber for poles, cross-arms and ties are of large proportions, open shipping and excellent freight facilities prevail, and the possibility of good selection and favorable terms are good.

It is not to be expected that these conditions will be maintained, nor that any readjustment will bring about further reductions. It appears reasonable to suggest, then, that potential purchasers give quick attention to selling conditions as they obtain today, and, unless we read the signs incorrectly, the conclusion will be—Buy Now!

GAS ILLUMINATION DATA.

At the annual meeting of the New England Association of Gas Engineers, held last month at Boston, Mass., Mr. Norman Macbeth, in a paper entitled "Why the Gas Man Should be an Illuminating Engineer," made some interesting statements concerning the competitive possibilities of tungsten incandescent lamps and Welsbach mantle gas lamps.

Mr. Macbeth stated that from tests of gas mantles of medium good quality it was shown that the efficiency from the initial to 100 hours of burning showed a drop of eleven per cent; at 250 hours, 12.8 per cent; at 500 hours, 27.2 per cent, and at 1,000 hours, thirty-three per cent. He naively added that "this, by the way, is not greater than the depreciation in the electric lamps by dust alone."

It is necessary, then, in order to bring the electric lamp down to the efficiency-losing class of the gas mantle, to drag in a little dust. Be this as it may, the figures given by Mr. Macbeth make agreeable reading to the electrical man, for where can it be admitted that an incandescent lamp of the poorest quality shows such a loss in efficiency in a thousand hours of burning? In fact, so sanguine have the manufacturers been of the maintenance of the candle-life of the incandescent electric lamp and so insistent has been the demand of central stations for a lamp that would maintain its candlepower, that years ago we knew all about a "suicide lamp" which would go out automatically if it so disgraced itself as to fall below eighty per cent of its initial candlepower within 800 hours of burning.

Referring again to the question of dust, it may be mentioned in passing that no one will believe that the incandescent-lamp bulb, with its smooth surface and its adaptability for quick and easy cleansing, is nearly so susceptible to exterior dirt as is the fragile mantle, which has little or no protection upon the dusty street and even less when installed in interiors.

Mr. Macbeth also presented an interesting table showing the gas requirements for illuminating a room fifty by thirty feet. It is unfortunate that the results given in this table are not taken from actual practice, but have been calculated, the method derived for calculating illumination from electrical sources being used.

STREET LIGHTING.

On another page of this issue Dr. Louis Bell contributes a most interesting article upon the subject of street lighting. This is a manly sermon on the gospel of more light, and it will be read with interest and profit by everyone concerned in the subject under discussion.

Dr. Bell points out the eccentricities which obtain in street lighting in this country and he again holds up as an example of a better utilization of electrical energy for illumination some typical illustrations abroad. He takes us over the ground once more and points out those features which have been emphasized before and which are always recognized, but which it seems so difficult to inculcate into the minds of those designing street installations here.

SOME PRINCIPLES OF STREET ILLUMINATION.

BY DR. LOUIS BELL.

Street lighting in this country, as elsewhere, has been a gradual growth from insignificant beginnings, and its faults chiefly spring from growth unregulated and irregular. In the larger cities it began with gas lighting on a small scale followed by the partial introduction of electric lighting. In smaller places it sometimes has practically begun with the rise of the electric arc. In either case the electric light was in the beginning costly and had to be employed rather sparingly with the result that the lights were too few in number, and in the effort to treat all citizens alike they were so badly scattered that the lighting, save in spots, was almost negligible.

Now the fundamental purpose of street lights is to illuminate the streets to a degree adequate for the purposes of their use. If a street is an evening thoroughfare crowded with passing throngs and active in business, it needs and ought to have good lighting, not merely enough to blunder about in, but enough to enable one to see his friends easily, to read numbers and signs freely, and even to consult his notebook or pocketbook without having to walk a block to the nearest light. Streets used mainly for residence purposes and with only moderate traffic after dark do not need so strong lighting, but still must have enough by which to see one's way, to recognize people, and to walk or ride comfortably without peering about in order to see things. Such streets also need for police purpose light enough readily to disclose prowlers and to discourage their activities. On the other hand, there are many sparsely populated districts in which even this secondary degree of lighting is unnecessary and the lights have merely the function of markers of the way to enable passersby to avoid obstructions and to make out their whereabouts. These distinctions are practical ones, and it is to the neglect of them that much inadequate illumination is to be charged.

So far as such distinctions have been recognized in American cities they have generally been marked by a mere difference in spacing of uniform lights. If the arcs in the main street are 300 feet apart the distance may span out to 500 or 600 or 1,000 feet elsewhere. Now the unfortunate fact is that at these larger distances the illumination, save relatively near the lamps, is so trivial as to be utterly ineffective, with the result that the street presents a series of moderately bright spots separated by wide, dark spaces. Within a couple of hundred feet the illumination given, even by the most powerful standard arc lamps, falls to a few thousandths of a foot-candle, rarely rising to as much as a hundredth. This darkness is exaggerated in effect by the brilliancy near the lamps, and the total result is very bad lighting.

The proper method of reckoning illumination in the streets has been a matter of much debate. The way customarily in this country has been to take it as the light received from the lamp concerned on a surface perpendicular to the direction of the ray. This is the light which one would receive in attempting to read a placard placed at the best angle to the light, and as the next light in the other direction would illuminate only the back of the card, its effect must be neglected.

The method customarily adopted abroad is to take the illumination received by the placard placed horizontally on the ground or at the height of three or four feet. This illumination decreases with the sine of the angle of elevation of the source as seen from the card, so that when the rays are nearly horizontal the illumination is vanishing. On the other hand, the lamps on both sides are effective and their effects must be added. The illuminations as reckoned by the two methods become equal when the angle of elevation of the lamps is thirty degrees, *i. e.*, when the lamps are spaced at four times their height apart. As this is not far from the usual practice in the main streets of Continental cities the method in use is there unimportant. But here where lamps may be, say, fifteen feet high and 300 feet apart, things are different, and the nominal illumination from one lamp will be perhaps five times as great as that from two lamps reduced to the horizontal plane. In other words, we not only space lamps so far apart that the illumination is trivial, but we bunko ourselves in its measurement. For while the average useful effect of the light is probably greater than the horizontal component would indicate, it certainly is quite inferior to the measurement taken on the normal to the ray.

It is obvious therefore that to get anything like a suitable degree of illumination for first-class streets, it is necessary either to increase the power or the number of the lights, or both. Just at this point of the matter arises the question of large versus small units, a question complicated by all sorts of side issues. Back of all these lies the fundamental question as to the meaning of good lighting. Of two streets, both lighted up to a good working value of the minimum, there is absolutely no doubt that the better effect is produced by the street in which there is the greater flux of light, provided that the sources of light are not too dazzling. In other words, to be thoroughly well lighted a street should have both a high minimum and a high average. With small units there is a tendency to secure the specified minimum with the lowest possible average. The advantage of the large unit with somewhat increased spacing is that the average is held high. Either method can be pushed to a *reductio ad absurdum*. The small units cost more per unit of light flux than big ones of similar efficiency, and the choice between them must be largely regulated by the results required.

As to the amount of light required as a minimum, it obviously varies with the class of street. For really first-class lighting in the chief streets of a large city, the writer is inclined to the opinion that the figure set by Mr. Voysey, electrical engineer to the streets committee of the corporation of London, is not excessive. His estimate is one-tenth foot-candle, measured by the horizontal component taken four feet above the pavement. This height is merely for convenience, as it is very hard to measure at the pavement unless the street is deserted. No standard arc lamp used in this country can give this value if the spacing between consecutive lamps is much in excess of 100 feet. Abroad, spacing of 100 to 125 feet is common practice, and high illumination is therefore common, especially as the arcs are commonly open ones of about ten amperes, or flame arcs of even greater power. The foreign open arcs, thanks to high-grade carbons and sensitive feeding mechanism, are substantially as steady as American enclosed arcs. Cannon Street, London, is lighted on about this basis, and is certainly well lighted, although less brilliantly than many other foreign streets. The lamps used are flame arcs, hung mostly on cross-suspensions about twenty-eight feet above the pavement, a position and height well adapted to good results.

Even half this minimum illumination if backed up by a high average can give fairly satisfactory results. The average

in the Cannon Street tests is somewhere about 0.6 foot-candle. But 0.05 foot-candle minimum obtained from small units generally implies a dim street. In certain cases, like important public squares, a higher minimum than 0.1 foot-candle is desirable, and abroad it is often obtained with beautiful results by very powerful arcs, usually of the flame variety, placed forty to fifty feet high. Since, other things being equal, powerful arcs are more efficient than small ones, strong illumination can as a rule be obtained more economically from the former than the latter. Once the arc spacing is established, especially with underground service, increase in the number of arcs is a pretty expensive matter, while increase in power is at the present time comparatively easy. The moderate and low-power arcs as found in American practice are as a rule so much inferior in efficiency to tungsten incandescent lamps that except in places where illumination of the first order is required, one can very often do better with incandescents both in illumination and in cost. Especially where trees line the streets, the powerful tungsten lamps now available do better service than arcs. It is pleasant to note that they are coming into considerable use for this purpose.

Until within the year just past there has been practically no street lighting of the first order in American cities. Even now the streets lighted anywhere near up to the common foreign standard are rare. In New York, Philadelphia, Baltimore, Denver and a few other smaller but enterprising cities there are now examples over limited areas of lighting that may well be imitated elsewhere. In one or two instances the illumination has been even a bit overdone through excess of enthusiasm. In several instances the particularly commendable improvement of using opal globes, universal abroad, has been at the same time introduced. If high power arcs are used the opal globe is almost a necessity in order to keep down the glare. A street lighted with naked arcs at the end of each long block is notoriously hard to drive through and produces an effect altogether unpleasant. A very thin opal globe reduces the trouble and at the same time greatly diminishes the shadows near the lamps.

The illumination of residence streets and the less-frequented business streets need not be pushed so high as in chief streets. There is much to be said for the arc in the business streets, owing to the higher average than with incandescents, which has a very considerable police value. From this point of view it is wise to consider as chief streets some of those which on property valuation would hardly deserve the name. It is altogether wrong to assume that the streets to be given illumination of the first order are entirely the richer ones. It is the amount of nocturnal use that counts. The residence streets are commonly the ones where a fairly good minimum with only a moderate average illumination is necessary, and these are well suited for the use of moderate units. Tungsten lamps, especially those of the larger candlepowers, can do admirable service here. As a rule incandescent lamps, like arcs, have been placed too low. Unless they are very closely spaced they do better at a height of twelve to fifteen feet than at the heights commonly employed with the old gas lanterns that they are rapidly replacing. It is very interesting to note the improvement made by such substituting of illuminants, especially when one considers the lighting during the life of lamp or mantle. The tungsten lamps, save for occasional cases of early blackening, due to faulty manufacture, hold up their power remarkably well, while time and dust seem rapidly to work havoc with mantles used upon the street.

As for outlying suburban streets and roads, lights merely as markers serve the purpose well until the increase of residences brings need for more lights. For markers the smaller sizes of incandescents down to fifty or forty-watt tungstens do admirably. Candlepower for candlepower, or even foot-candle for foot-candle, the small lamps are relatively expensive, but when it comes merely to putting a marker at the corner of each block or the like, the small light is sufficient. In such cases the illumination, save near the lamp, does not count at all. It may be objected that this is not illumination, but such streets as those here considered are commonly now not lighted at all, or merely get the fraction of an arc where they cross important thoroughfares. These small units are also valuable in back alleys and other places which are rarely used. The upshot of the matter is that we in this country have been getting behind the game in street lighting, and it is time to get up and be doing. The new and efficient arcs and incandescents give an opportunity for getting greatly increased illumination with very little extra cost. Cities must bear their part by assuming the work of proper distribution of lamps, and they might with great advantage take a hand in putting up more artistic fixtures, especially in parks and important streets. Those now in use are too often cheap and ugly as well as ill-placed. The useful mast-arm, for instance, as too often put up, is about the shabbiest looking thing imaginable, and one finds in conspicuous places in parks some of the most atrocious fixtures that it ever entered into the mind of man to design.

The work of good lighting is one in which the central stations and the cities must co-operate. Their relations are on the whole improving of late and the time is ripe for working hand in hand. The old and notoriously inefficient illuminants must go and with the added resources must come added skill in their use, so that our cities shall not only be well lighted but artistically and appropriately lighted.

Elaborate Illumination Scheme for Niagara Falls.

It is planned to illuminate Niagara Falls along the lines originally laid down by W. D'Arcy Ryan, illuminating engineer of the General Electric Company. This means the expenditure of between $125,000 and $150,000 and the installation of probably the most powerful aggregation of electric projectors ever assembled. Mr. Ryan has been with his assistant, G. H. Stickney, making a survey of the situation. The illuminating of the Falls in 1907 created worldwide interest, but the spectacle this year will far eclipse the first attempt. Lights of more than two billion candlepower total strength will be projected upon the face of the falls and the aurora of the combined batteries will be visible as far away as Toronto. Sixty-inch projectors will be used and the spectacle is to be a permanent summer feature.

New England Section, Illuminating Engineering Society.

The next meeting of the New England Section of the Illuminating Engineering Society will be held in the auditorium of the Edison Building, 39 Boylston Street, Boston, Tuesday evening, March 16. An interesting and instructive paper will be read on "The Simplification of Illumination Problems Through the Conception of Light Flux," by J. S. Codman. L. D. Gibbs is secretary of the New England Section of the Illuminating Engineering Society.

ORNAMENTAL PRIVATE LIGHTING IN THE CITY OF NEW YORK.

BY H. THURSTON OWENS.

Private lamps of ornamental character were the forerunners of the present-day public lighting, which dates back to the year 1823 in the city of New York, and these installations still continue to play an important part in the appearance, both day and night, of the city highways.

In the early days the custom of placing additional burners in the lamps was quite popular, being confined mostly to hotels and business houses. Occasionally the owner of a private house would erect one or two entrance lamps, but, as a rule, residents were satisfied with the regular

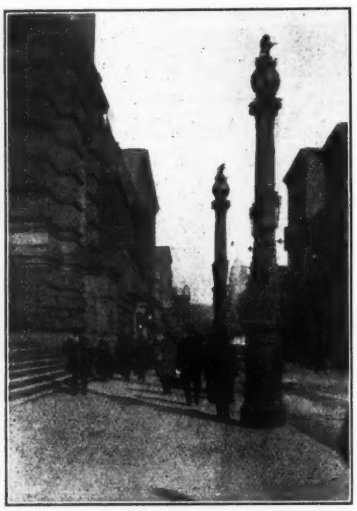


FIG. 1.—CRIMINAL COURTS, CENTER STREET.

city installation, and few lamps of this character are now in use.

The custom of placing special lamps has been quite common in the case of municipal buildings, the one illustrated in Fig. 1 being the Centre Street entrance to the Criminal Courts Building. These columns are one of the architectural features of a building which is only second to "Old Bailey" as the scene of celebrated trials, and they illustrate a style no longer popular.

Compare them with the handsome entrance standards before our newest public building, the Hall of Records, the Chambers Street entrance being shown in Fig. 2. There is no question that they fulfill their purpose of adorning as well as lighting the entrance.

Another public building of entirely different character is shown in Fig. 3, being the Sixty-ninth Regiment Armory at Lexington Avenue, between Twenty-fifth and Twenty-sixth streets. The simple lines which predominate in the building have been followed in the design here and they are very effective lighting units as well.

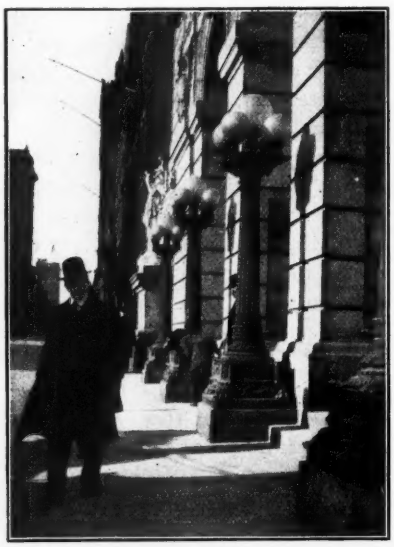


FIG. 2.—HALL OF RECORDS, CHAMBERS STREET.

The vast majority of ornamental installations have been installed because of their advertising value, although this is only an indirect advantage, as the posts rarely carry even the name of the hotel or business house providing them. This is illustrated in the installation before the

FIG. 3.—SIXTY-NINTH REGIMENT ARMORY, LEXINGTON AVENUE AND TWENTY-FIFTH STREET.

Hotel Knickerbocker at Broadway, on the southeast corner of Forty-second Street, one of the posts being shown in Fig. 4. The building is French Renaissance, but to just what period the fixture belongs it would be hard to determine. The lanterns are made with sides, are of clear plate glass and each contains five sixteen-candlepower clear bulbs in a pendant position.

At the Park Avenue Hotel in Park Avenue, between Thirty-second and Thirty-third streets, there is an installation which has little merit. The posts, one of which is shown in Fig. 5, are heavy enough to carry a much larger lighting fixture, and there is also enough current used to warrant this, no less than six thirty-two-candlepower lamps being used.

This type of ornamental lamp-post erected by private owners along the curb far outnumber those of any other city, but the writer ventures to predict that

FIG. 4.—HOTEL KNICKERBOCKER, BROADWAY AND FORTY-SECOND STREET.

they have reached the height of their popularity.

There are several reasons for this, one being the greater architectural value of both standards and brackets. The former type has already been described (Fig. 2) and the latter is shown in Fig. 6, being the Hotel Plaza, Fifth Avenue, on the southwest corner of Fifty-ninth Street. These lanterns are one of the same period of architecture as the Hotel Francois the First, and are made of bronze with one fifty-candlepower lamp in each.

Another reason for the use of bracket lamps is to be found where the hotels have balconies a few feet above the street level, which are used for dining purposes in the summer-time, and the fixture there used is a standard along the balcony railing. This type is illustrated

in Fig. 7, in the Hotel Gotham, Fifth Avenue and Fifty-fifth Street, the hotel opposite being the St. Regis. The twin arc also shown in this cut is the regular municipal fixture used on this thoroughfare.

The paramount reason for the decadence of the curb post is naturally one of dollars and cents, and it may be summed up by the statement that building signs are so much in vogue that the light from posts is overshadowed and therefore ineffective. An instance of this is shown in Fig. 8, being the Broadway Theatre, Broadway, on the southwest corner of Forty-first Street. The equipment

FIG. 5.—PARK AVENUE HOTEL, PARK AVENUE AND THIRTY-THIRD STREET.

consists of arcs and clear glass lanterns, a most unsightly combination. Streaky lights are neither effective nor ornamental, and by simply using a frosted or opal glass the effect would be greatly improved.

Aside from the fact that the building sign is larger, there is another reason why it attracts more attention than the posts and that is the fact that it is a kaleidoscope of color and movement, the two circles being chasers operating in opposite directions, color caps of red, white and blue being used on the bulbs.

All of the lamps illustrated were installed and are maintained at the expense of either the private owners or the municipal department concerned, and have no connection with the regular municipal street lighting.

The American Electrochemical Society at Niagara.

It seems highly probable that the meeting of the American Electrochemical Society, to be held in Niagara Falls on May

FIG. 6.—HOTEL PLAZA, FIFTH AVENUE AND FIFTY-NINTH STREET.

6, 7 and 8, will be one of the most enthusiastic and satisfying conventions of electrochemical and metallurgical interests ever held. Because of the fact that one day is to be devoted to electrometallurgical

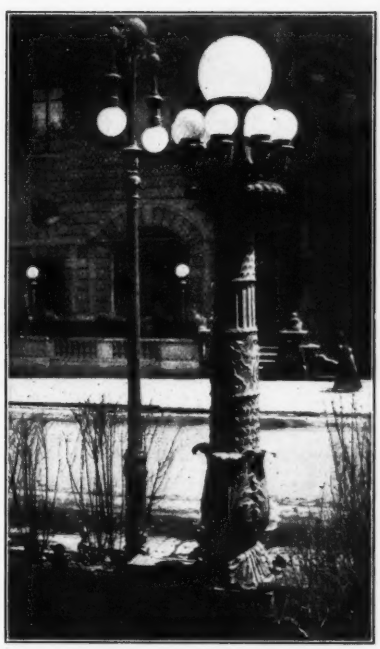


FIG. 7.—HOTEL GOTHAM, FIFTH AVENUE AND FIFTY-FIFTH STREET.

subjects, unusual interest is being displayed by men connected with that line of research both in this country and throughout Europe.

The American Electrochemical Society, under the activity and vigor given to it by the officers and members associated with Dr. Edward G. Acheson, its president, is fast gaining recognition as one of the most important bodies of workers. It has come to be realized that electrochemistry and electrometallurgy have much in them of common interest, and at the Niagara meeting it is proposed to cement the development and growth of the sympathetic assistance one field offers to the other, so that the Niagara convention will have a greater significance for workers in these fields than any other convention ever held.

In addition to the valuable papers previously announced the information is given that word has been received from Ch. Albert Keller, of des Establisements Keller-Leleux, Paris, France, saying that he will contribute a paper.

Cav. Ernesto Stassano, Forni Termoelettrici Stassano, Turin, Italy, will also

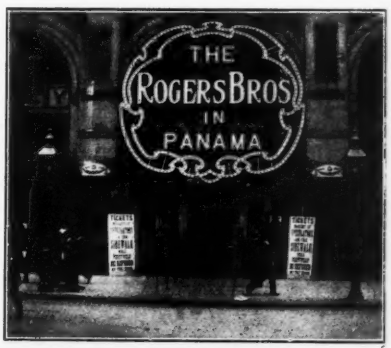


FIG. 8.—BROADWAY THEATER, BROADWAY AND FORTY-FIRST STREET.

contribute a paper and expects to be present at the meeting in person.

Paul Girod, Société Anonyme Electrometallurgique, Ugine, France, has given further details of the nature of his paper, which will apparently be largely devoted to an illustrated description of the new steel works at Ugine. This plant will probably be in operation in April. The installation includes two furnaces of twelve-and-one-half tons capacity, two furnaces of two-and-one-half tons capacity, two rolling mills, and a large forge and steel molding shop, the whole installation being exclusively operated by electricity.

Telephone Reception Entertained by Distant Orchestra.

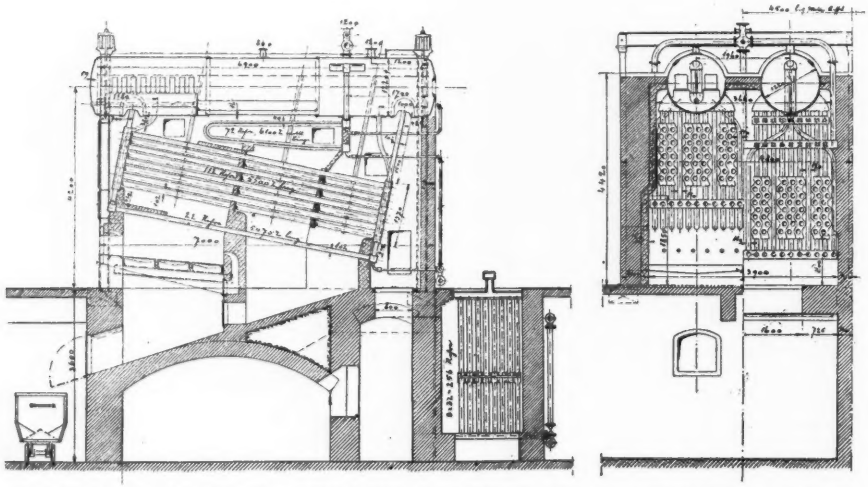
A feature of the opening of a new telephone exchange at Joplin, Mo., was an informal reception tendered to the citizens. The guests were entertained by an orchestra stationed at Pittsburg, Kan., seventy-five miles away, the music being transmitted telephonically and reproduced by a large receiving sounder.

The Design of Steam-Electric Power Plants.

BY FRANK KOESTER.[1]

The problems involved in the design of a power plant cover a broad scope. It is not of consequence to design any particular type of machine but to select and arrange the machines already on the market, so as to form a complete plant for generating electricity from coal on a commercial basis. The aim of the designer must be to keep down the first cost as low as possible as well as the expense of operation and maintenance. To accomplish this much practical experience is necessary.

In designing plants it should be the aim of the designer to preserve certain standards adopted, viz., the structural steel arrangement should be the same for all bays, the type of auxiliaries should, as far as possible, be the same for all units, certain methods of running the piping should be carried out in connection with all the units, etc. Such a scheme will facilitate the design, construction and also the operation of the plant. No attempt, however, should be made to standardize all plants, as this results unfavorably to the small manufacturing concerns, who, in order to compete with the large concerns, are anxious to produce more efficient machinery, and the large concerns would rest upon their reputations already acquired.



STEAM-GENERATING UNIT (ECONOMIZER, BOILER AND SUPERHEATER) OF THE MUNICIPAL LIGHT AND POWER PLANTS, VIENNA.

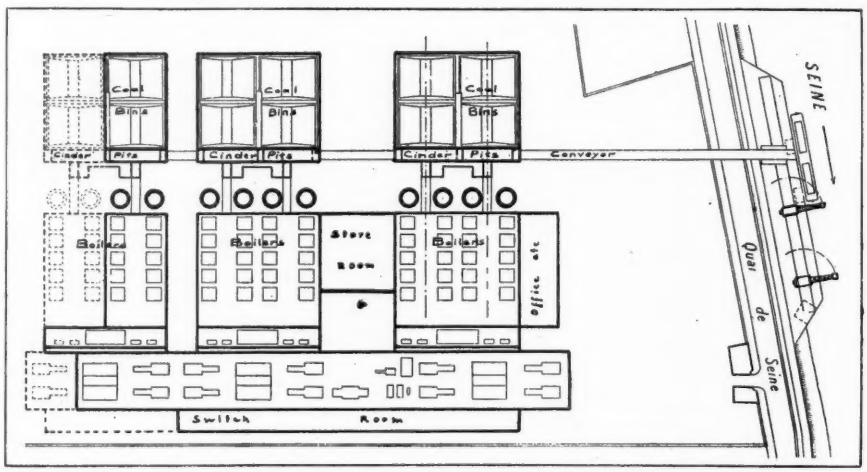
The design of a power plant must be carried on under one head, as the various branches of the work are closely related and require harmony in the design, which will result in better and more economical operation of the plant.

In this paper the various subjects will be treated under separate headings.

LOCATION.

The selection of a location for a power plant is governed by various conditions, viz.: transmission of current, coal and water supply, disposal of ashes, as well as the cost and character of the land necessary and available for future extension.

In order to provide an economical distribution of current the power plant should be located in the centre of gravity of the district to be supplied. The coal and water supply are of great importance. With reference to the coal supply, the plant should be so located that railroad sidings may be utilized, and furthermore, a location on a navigable stream or at tidewater is desirable, so that coal may be supplied to the plant by more than one facility for transportation. Available space for the storage of coal must be considered, so that a supply of coal may be kept on hand for tiding over a certain period in case of strikes at the mines or on the railroads. The plant must be located as closely as possible to the water supply for condenser and feed-water necessities in order to avoid the expense of long intake and discharge tunnels or conduits.



PLAN OF THE ST. DENIS PLANT, PARIS.

The land acquired should be of sufficient area to provide for future expansion and against the crowding of the power plant equipment. In selecting the site the character of the soil must be well considered with reference to its bearing capacity, to avoid expensive pile driving and exorbitant foundation expense. Another consideration that must not be lost sight of is the facility for securing and providing for the comfort and convenience of the operating force. While it might be easy to secure such a force, it is often most difficult to retain them because of the lack of congenial surroundings.

GENERAL ARRANGEMENT.

In laying out a power plant it is necessary that boiler room, engine room and switch rooms should be arranged as distinct, separate rooms, particularly for large power plants, in which division walls may be provided. A recent practice consists in having a separate switch-room building, as is the case in the Fisk Street

1. Consulting engineer, New York.

plant in Chicago and the Port Morris and Yonkers plants in New York.

Since the introduction of steam turbines it has become a somewhat general practice to arrange the boiler room so that the firing aisle will be at an angle of ninety degrees to the generating room. The boiler building should be one continuous room; it may have as many firing aisles as deemed advisable, and should not be broken up into several separate boiler houses as was done at the St. Denis plant in Paris, which is the largest Parsons turbine plant in Europe. The accompanying plan shows the arrangement of boiler houses for this plant. With such arrangement more ground is required, the separate buildings are more expensive and the general supervision of the operating force is handicapped.

The floor areas occupied are as follows:

Boiler room .....1.12 sq. ft. per K. W.
Generator room ... .70 sq. ft. per K. W.
Switching room ... .26 sq. ft. per K. W.

Total .....2.08 sq. ft. per K. W.

However, the total area of the rectangle, including the unoccupied space between these buildings, is 2.9 square feet per kilowatt.

than a reciprocating-engine plant, the space required for the turbine plant with boiler room at right angles may come within the same general dimensions as the space required for a reciprocating-engine plant with boiler room and firing aisle parallel to the generating room. Sometimes the space required for such a turbine plant will exceed these dimensions and the following table will give a fair comparison:

TABLE I.—COMPARISON OF AREA AND VOLUME OF POWER HOUSES PER KILOWATT CAPACITY.

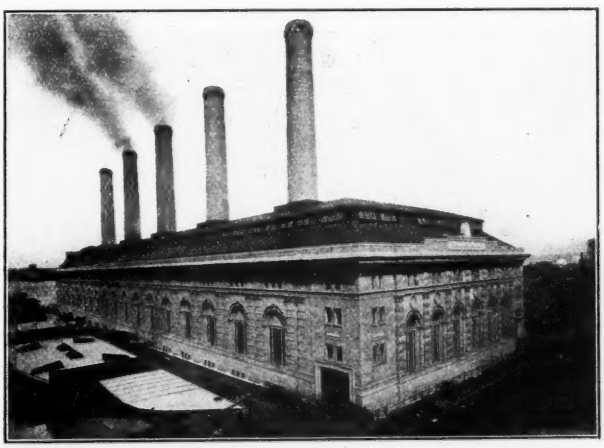
Name of Plant.	Square Feet per Kilowatt.	Cubic Feet per Kilowatt.	Number of Boiler Floors.	Type of Prime Mover.
St. Denis, Paris	2.08	...	1	Turbines, horizontal
Chelsea, London	1.51	142	2	Turbines, horizontal
Long Island City	1.36	120	2	Turbines, horizontal
Waterside I, New York	0.95	110	2	Turbines, vertical, and engines
Waterside II, New York	0.80	108	2	Turbines, vertical and horizontal
Fort Morris, New York	1.32	102	2	Turbines, vertical
Yonkers, New York	1.32	102	2	Turbines, vertical
Fifty-ninth Street, New York	2.32	259	2	Engines, vertical
Seventy-fourth Street, New York.	2.05	222	2	Engines, vertical
Ninety-sixth Street, New York	1.40	170	3	Engines, vertical
Kingsbridge, New York	1.88	156	2	Engines, vertical
L Street, Boston	2.45	148	1	Turbines, vertical
Fisk Street, Chicago	2.42	140	1	Turbines, vertical
Potomac, Washington	1.55	84	1	Turbines, vertical
D. & H., Mechanicville, N. Y.	2.22	130	1	Turbines, vertical
Bow Road, London	2.91	232	1	Engines, vertical and horizontal

As the turbine together with its comparatively large condenser apparatus occupies less space than the reciprocating engine, in making comparisons between the two types of prime movers the floor space of the generating room only (exclusive of switch room) should be considered. The following table gives the data for comparison:

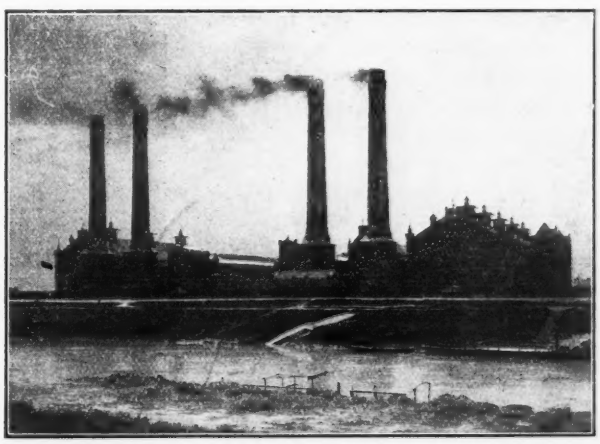
TABLE II.—COMPARATIVE AREA OF GENERATING ROOMS.

Plant.	Square Feet per Kilowatt.	Type of Prime Mover.
Bow Road, London.	0.903	Horizontal and vertical engines
Fifty-ninth St., New York	1.085	Vertical engines
Chelsea, London	0.413	Horizontal turbines
Potomac, Washington, D. C.	0.388	Vertical turbines
D. & H., Mechanicville, N. Y.	0.561	Vertical turbines
St. Denis, Paris	0.703	Horizontal turbines

A plant should consist of a system of complete units, *i. e.*, each prime mover unit must have its own complement of boilers, which also applies to the condenser apparatus and other auxiliaries, both mechanical and electrical, belonging to such unit. A chimney may be provided for each unit or for a combination of units. The St. Denis plant mentioned above, which will consist when completed of twelve main prime movers arranged in one single building, about 650 feet long and sixty-five feet wide, has three separate boiler houses, each 140 feet square, and containing twenty boilers in four rows, thus forming with four prime movers one complete unit, four chimneys being provided for each unit as well as one coal-storage and ash-handling system. The boiler houses are separated from the generating room by a compartment containing the feed-water supply apparatus, such as water purifiers, tanks and boiler-feed pumps. A tender is stationed in this compartment for observing, by automatic electromechanical signals, the water levels of the twenty boilers (constituting one complete unit) and for attending the pumps and purifying apparatus. The advantages of the complete unit system consist in the simplicity of the design and the possibility of increasing the capacity of the plant by adding additional units without interfering with the present arrangement and operation. Another



THE FIFTY-NINTH STREET POWER PLANT, NEW YORK CITY.



TWIN MUNICIPAL PLANTS AT VIENNA, AUSTRIA.

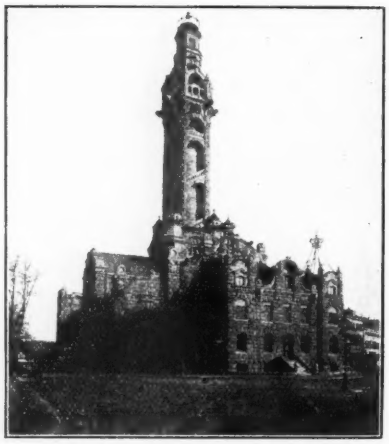
The advantages in arranging the boiler room at an angle of ninety degrees to the generating room do not consist in the reduction of the space required but in providing better light and ventilation, a more serviceable and easily operated coal and ash-handling system and a more simple and flexible piping arrangement, the latter feature being of particular value in cases of emergency.

In a plant with the boiler room and firing aisle arranged at an angle of ninety degrees to the generating room, more space will be required for the building. As a turbine plant requires less room

advantage in the operation of the plant is the feasibility of shifting the operating force from one unit to another in cases of emergency or when an additional unit is added to the plant.

BUILDING.

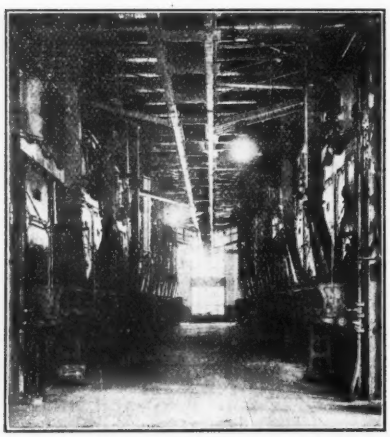
The superstructure for medium-size and large plants must be of skeleton steel



HIGH-PRESSURE STEAM HEATING, TRANSMISSION AND LIGHTING PLANT AT DRESDEN, GERMANY.

construction to carry the various floors, boilers, coal bunkers, etc.

In one-story boiler rooms rolled steel-plate coal bunkers are generally installed, their storage capacity ranging up to ten tons per running foot, the average being five to six tons. These bunkers may be either of the suspended type or of rigid construction. In multiple-story plants it is preferable to install bunkers of greater capacity. For this purpose masonry bunk-



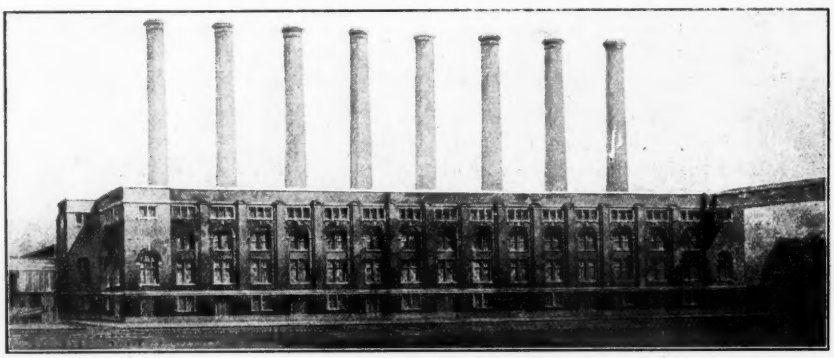
BOILER ROOM, PORT MORRIS POWER HOUSE, NEW YORK CENTRAL ELECTRIFICATION.

ers must be provided having a storage capacity up to thirty or even thirty-five tons per running foot. The slope of all bunkers must be greater than the angle of repose. In bunkers of the rigid construction the slope is forty-five degrees for convenience of design and manufacture.

In designing bunkers no dead pockets must be left, as they frequently are the cause of spontaneous combustion. Another cause of spontaneous combustion is poor ventilation, the hot gases of the boiler room not being fully drawn off from above and at the sides of the bunkers. Where it is not possible to provide ample windows for complete ventilation, ventilating flues may be run through the bunkers or the latter may be built to constitute a series of separate bunkers between which provision is made for light and ventilation.

For all medium-size or large plants a basement should be provided for facilitating the handling of ashes, for blowers, water-storage tanks, boiler-feed piping, etc.

The arrangement of the generating room will depend upon the type of prime movers adopted, as also whether or not a basement is required. Reciprocating engines and Parsons turbines should have preferably a basement for auxiliary machinery, which particularly applies to medium-size and large plants. The vertical Curtis turbine permits the arrangement of condenser apparatus on the same



THE DELAWARE AVENUE POWER PLANT OF THE PHILADELPHIA RAPID TRANSIT COMPANY.

floor, and basements may be easily dispensed with when this type of prime mover is used. For convenience in ob-

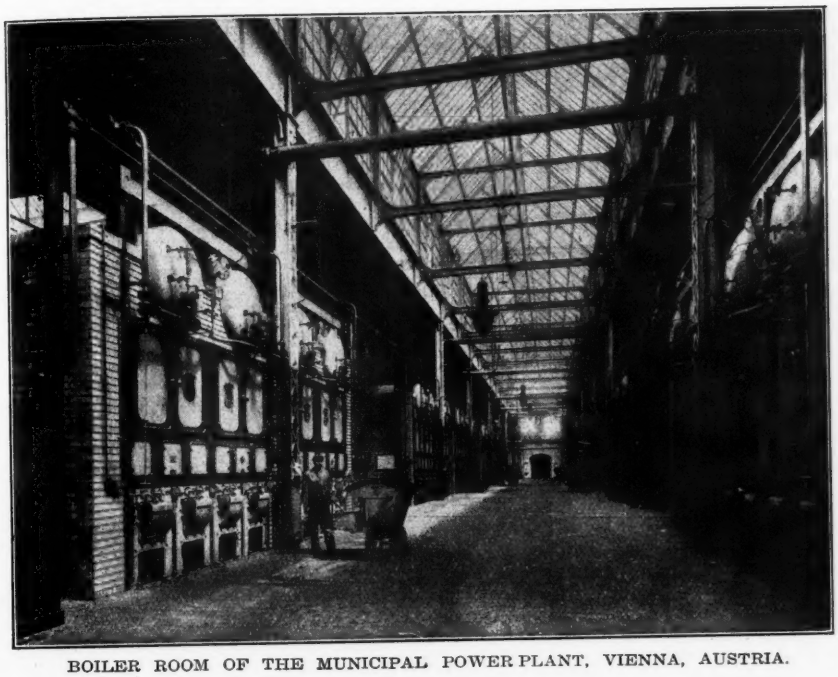
BOILER ROOM OF THE LIGHT AND POWER PLANT "BILLE," HAMBURG, GERMANY.

serving the operation of the plant and of reaching the various prime movers, galleries are provided at the sides of the generating room and may be connected to the switchboard gallery. These gal-

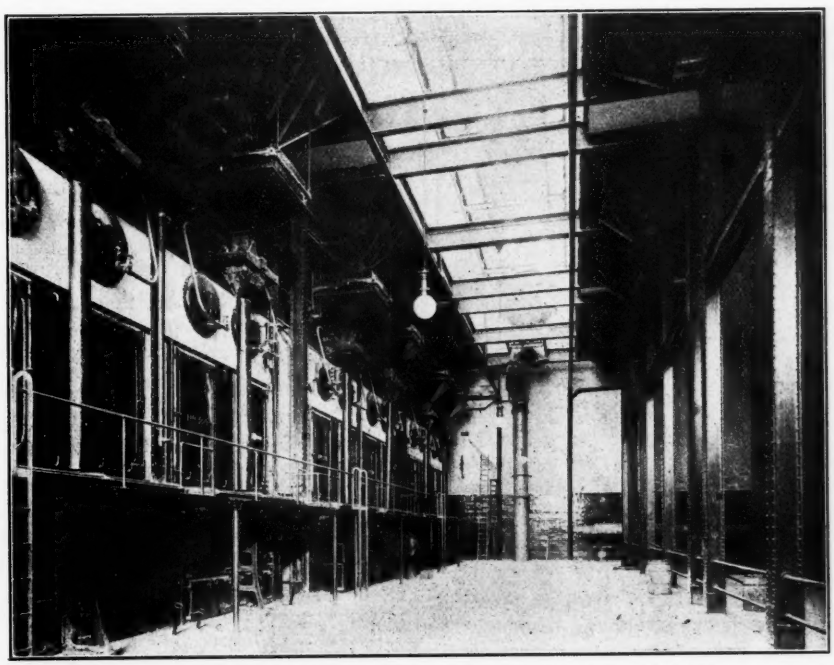
leries, which are installed in connection with vertical prime movers only, are frequently forgotten in designing the plant and much trouble is experienced in the attempt to provide them later.

When it is desired to place ventilators in the roof of the generating room they must be put in in a workmanlike manner, that there may be no leakage of rain water upon the generator, which might cause shutdowns and serious consequences to follow. For the same reason particular care must be exercised in the construction of the entire roof.

As already mentioned, the switching room should be kept separate from the generating room, which is best accomplished by a division wall. The main controlling bench is preferably located on the gallery at a point from which the entire generating room may be easily overlooked. For this purpose a glass partition may be provided in the division wall. All outside windows in the switching room must be kept closed; fixed windows may be inserted as a matter of economy, as serious shutdowns have occurred, due to dust or foreign matter flying through the windows. The number of floors provided for the switch room will depend upon the size and character of the plant.



BOILER ROOM OF THE MUNICIPAL POWER PLANT, VIENNA, AUSTRIA.



INTERIOR OF BOILER ROOM, L STREET PLANT, BOSTON.

The live load to be carried by the various floors depends upon the equipment. The following table gives the live loads for which the floors were calculated in the Fifty-ninth Street power house, New York. The plant is equipped with 600-horsepower boiler units, above which is a floor for economizers; the engine room contains 5,000-kilowatt vertical reciprocating engines, while the extension of the engine-room floor carries the 11,000-volt oil switches, and on the floor below is located the main bus-bar system, while on the floor above the oil switches is the switchboard gallery.

TABLE III.—LIVE LOADS IN FIFTY-NINTH-STREET PLANT.

Part of Plant.	Lbs. per Square Foot.
Boiler-room floor	250
Economizer floor	150
Engine-room floor	400
Oil-switch floor	400
Bus-bar floor	400
Switchboard floor	300

For the purpose of making comparison as to the amounts of steel required in the construction of power plants recently erected the following table is submitted:

TABLE IV.

Name of Plant.	Tons of Steel.	K. W. Normal.	Tons Steel per K.W	Sq. Ft.	Cu. Ft.
Potomac, Washington, D. C.	800	19,000	.042	.027	.0005
Port Morris, New York	2,800	30,000	.094	.075	.0009
Fifty-ninth Street, New York	12,300	60,000	.205	.088	.0008
Chelsea, London	6,000	57,700	.104	.076	.0007

The first two plants named in this table have Curtis turbines, the Fifty-ninth Street plant has vertical reciprocating engines and the last named has Parsons turbines. The Potomac plant has a single-floor boiler room with structural-steel bunkers of six tons per running foot. In the Port Morris and Fifty-ninth Street plants the chimneys, which are of radial brick, are supported on the structural steel, the coal bunkers being of the same capacity in each plant, viz., thirty tons per running foot. While the Port Morris plant has two boiler floors, the Fifty-ninth Street plant has one boiler floor and one economizer floor. The Chelsea plant has two boiler floors, with the economizers arranged directly in the rear of the boiler rooms, and bunker capacity of about thirty tons per running foot.

ARCHITECTURAL TREATMENT.

Within the past few years marked progress has been made in the architec-

tural treatment of power plants, as applied to their exterior, as well as the interior of the generating rooms. While not much is expected in the architectural treatment of the boiler house, yet much can be done in this direction both as to the main floor and the basement, as pertains to cleanliness and sanitation. Both affect not only the appearance of the boiler room but they also affect the morale of the boiler-room force, which force will be better satisfied and consequently work with greater efficiency. It might seem that these conditions are chargeable only to the management of the plant, but they are also, to a large extent, chargeable to the designer of the plant, who should provide proper conditions for enabling the management to keep the boiler room clean and in a good sanitary condition.

In order to show what has been done in this country in the matter of architectural treatment and to make comparisons with the results accomplished abroad in this respect the accompanying illustrations may serve.

BOILERS.

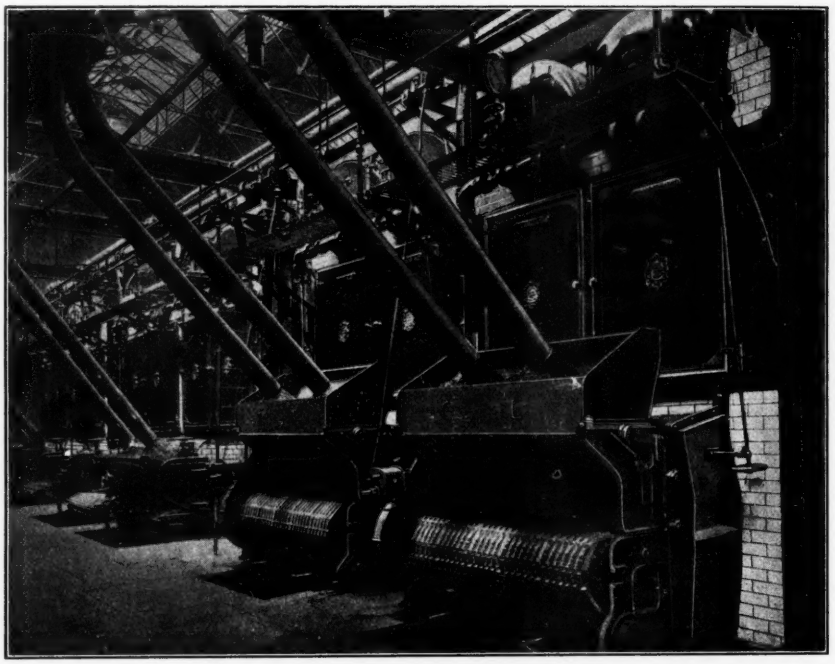
Modern power plants, particularly those installed for railway service, are provided almost exclusively with the water-tube type of boilers, owing to the fact that these are quicker evaporators and consequently better able to take care of sudden overloads, a steady supply of feed water at a high temperature being, however, essential. The prevailing custom in this country is to rate boilers by boiler horsepower (B. H. P.). As concerns the heating surface required, this varies with the makes of the boilers, running from ten to 13.5 square feet of heating surface per boiler horsepower.

The number of boiler horsepower required per kilowatt of prime-mover capacity depends of course upon the amount of steam consumed by the prime movers. The table herewith gives the amount of heating surface in square feet per kilowatt for various plants installed in America and in Europe.

With the increase in capacity of the individual prime mover the capacity of boilers has also been increased. For large-size plants the average individual boiler capacity is from 500 to 600 horsepower, while in some cases boilers of approximately 1,100 horsepower are installed, viz., in the Bow Road station, London. In this plant the boilers are encased in a cast-steel housing similar to the marine type of boilers, for the purpose of reducing the leakage, which practice has been followed in this country.

In recent years a practice has developed, both in Great Britain and in this country, in which the boiler is provided with two grates, one in the front end of the boiler, as usual, and the other at the side or rear end of the boiler, a notable instance of which is in the specially large boilers in the Bow Road station, London, mentioned above. A similar installation has also been provided at the Fifty-ninth Street plant in New York in connection with several 600-horsepower Babcock and Wilcox boilers, a paper on which was read before the American Institute of Electrical Engineers on December 13, 1907. In this paper it was shown that these boilers, provided with single and double furnaces, respectively, when operating with equivalent economical evaporation, developed 627 boiler horsepower in the former case, while with the double furnace 1,078 boiler horsepower was developed.

It must be understood that a boiler provided with two grates must be designed especially for these double grates in order to provide for the increased evaporation. Otherwise it may occur that the increased evaporation in the lower row of tubes will not be provided for, so far as area of passage is concerned at the connecting tubes between the headers and drums. The 600-horsepower boiler in question consists of three drums and fourteen times twenty-one tubes. Each row of fourteen vertical four-inch tubes is connected to the drum by a four-inch connecting tube, and the circulation through all of these fourteen tubes must pass into the drum through this one four-inch connection. The natural result is that the formation of steam in the lower



STUART STREET PLANT AT MANCHESTER, ENGLAND.

TABLE V.—BOILER HEATING SURFACE PER KILOWATT CAPACITY.

(Normal Rating.)

Plant.	Sq. Ft. Heating Surface per K. W.	Type of Prime Mover.	Service.
St. Denis, Paris	4.5	Turbine	Subway and lighting
Chelsea, London	7.6	Turbine	Subway and lighting
Long Island City	7.6	Turbine	Heavy railroading
Waterside I, New York	6.5	Turbine	Power and lighting
Waterside II, New York	8.0	Turbine	Power and lighting
Port Morris, New York	5.0	Turbine	Heavy railroading
Yonkers, New York	5.0	Turbine	Heavy railroading
Fifty-ninth Street, New York	7.5	Engines	Subway railway
Seventy-fourth Street, New York	8.2	Engines	Elevated railway
Ninety-sixth Street, New York	6.7	Engines	Street railway
Kingsbridge, New York	5.6	Engines	Street railway
L Street, Boston	8.2	Turbine	Power and lightning
Potomac, Washington	5.1	Turbine	Street railway and lighting
D. & H., Mechanicville, N. Y.	6.9	Turbine	Street railway and lighting
Bow Road, London	5.4	Engines	Power and lighting
Municipal, Vienna	6.0	Engines	Power and lighting
Delaware Avenue, Philadelphia	10.0	Turbines	Street railway

row of tubes takes place faster than can be conducted through the four-inch connecting tube, which is particularly true when an additional furnace is provided. This practice necessitates more frequent repairs, such as replacing tubes, etc., and consequently the life of the boiler is materially shortened. For this reason it is questionable whether there is, in the long run, any economy in the practice of installing a second furnace under a boiler not especially designed for it.

To overcome this objection a boiler designed, as shown in the illustration on page 472, which represents a modification of the standard B. & W. boiler, as manufactured by an Austrian concern for the Vienna municipal light and power plants will serve the purpose. It will be noticed that the lower row of tubes is connected to horizontal headers which are separated by distance nipples from the vertical headers. The horizontal headers, in front and rear, are directly connected by vertical risers with the drum so that the evaporated steam may pass unobstructed from the lower row of tubes directly to the drum as well as through the vertical headers.

[To be continued.]

Photo-Telegraphy Between New York and Washington.

On March 4 the first practical demonstration of telegraphing photographs was made in the United States, photographs of President Taft and ex-President Roosevelt being flashed over the wires from Washington to New York.

Shortly after the successful trials of the Korn apparatus were made between Paris and London, *Collier's Weekly* acquired the American rights. In testing the machines built for American use photographs had already been sent on a circuit from New York to Philadelphia and return, but the first public test of the telephotograph in this country was made on March 4.

Electrical Supplies for the Levant.

A report has been received from an American consul in the Levant announcing the opening of a department store, the first of its kind in that region. He says American manufacturers should send the proprietor catalogues of telephone and electric-light equipment. The name may be obtained by inquiry addressed to the Bureau of Manufactures, Washington, D. C., referring to File No. 3153.

B. J. Arnold's Report on New York Subway.

Bion J. Arnold, consulting engineer for the Public Service Commission, has made a report to the commission on the "Return on the Investment in the Subway."

He summarized the report as follows:

1. Raise all the money for the construction and equipment of such portions of future subways as can be shown to be profitable upon the city's credit and at the lowest possible rate of interest.

2. For such portions of the system as are clearly unprofitable, let the territory, the value of which is enhanced by the construction of the subways, bear the burden of the initial cost.

3. Eliminate taxes as is now done with the present subway.

4. Extend the refunding period for the retirement of the cost of subways over as long a period as practicable.

5. Design the express stations of the main stems of such subways upon the reservoir principle so as to secure maximum capacity with minimum investment.

6. Lay out a comprehensive system of transportation and begin the construction of subways at the centre of the congested district and extend outward in order to get the benefit of the short-haul profits before assuming too much of the long-haul burden, and in connection with the short-haul business investigate carefully the possibilities of moving platforms for the local tracks.

7. Take advantage of specific cases where railroad companies desiring to secure terminals, the indirect value of which to them is great, may be willing to contribute largely to the cost of building portions of a comprehensive subway system.

8. Lease the operating privileges, under proper public supervision, to an operating company upon the basis of an agreed compensation per car-mile—the number of car-miles to be operated, which is the measure of service, to be determined by dividing the income from the traffic by the total cost of operating a car-mile, the income to be sufficient to provide for operating expenses, including maintenance, fixed charges and depreciation, and leave sufficient margin to sufficiently compensate the operating company so as to secure the highest class of skill and efficiency in operation.

The report analyzes the car-miles run without return, and says that about 1,000,000 of them per year are due to lack of storage space in lower Manhattan for the use of cars that travel practically empty before or after each rush-hour.

In detail the report covers and analyzes the earnings, expenses, fixed charges, etc., and makes a list of possible economies.

It is feasible, says Mr. Arnold, even if all of the suggested economies are not realized, to construct, operate and maintain subways in certain localities within the congested districts of the city of New York and operate them upon a five-cent fare—but if to these short-haul subways is added the burden of a long haul into sparsely settled territory, such subways as a whole will not be sufficiently attractive to induce private capital to construct and operate them unless a fare somewhat higher than the present five-cent fare is allowed for the long-haul passengers for at least a period of years, or until such time as the local traffic builds up throughout the entire length of the subway.

If it were possible to establish a fare greater than five cents for the long-haul passenger, the solution to the problem would be simple from a railroad standpoint although complicated and disadvantageous to the public.

Revoke British Patents.

The Lloyd-George act, 1907, which requires patented articles sold in the United Kingdom to be manufactured there, became operative a few weeks ago. As a result the Controller General of Patents has revoked two patents.

Of the two patents revoked, one is an invention relating to electric arc lamps, of which the registered proprietors are the British Westinghouse Electric and Manufacturing Company, Ltd. The secretary of the company urged that the patented article had been manufactured to a large extent in the United Kingdom, and that of 1,308 made at the works at Old Tratford up to last October, 274 remained unsold at that date.

The Controller General found, however, that between 1906 and 1908 9,856 lamps have been imported by the Westinghouse company's licensees, Koerting & Mathisson, a German company. He is satisfied that the allegation that the patented article is manufactured mainly outside the United Kingdom is correct, that the patented article is not manufactured to an adequate extent in the United Kingdom, and he, therefore, decided, subject to an appeal to the courts, to revoke the patent forthwith and order the patentees to pay to the applicant the sum of seventy-five guineas in respect of his costs.

ALTERNATING CURRENTS AND THEIR APPLICATIONS.

BY EDSON R. WOLCOTT.

CHAPTER VI. (PART II.)—LIGHTING.

CARBON-FILAMENT INCANDESCENT LAMPS.

Until quite recently, incandescent-lamp filaments made of specially prepared carbon have been exclusively used. In making these lamps a filament is sealed into an exhausted bulb. When the external terminals are connected to a source of electricity having a suitable voltage, sufficient current flows to bring the filament to a state of incandescence and light is emitted. Of course considerable heat is also evolved, and efforts are being put forth to convert a maximum amount of electrical energy into light energy. The filament is sealed into an exhausted bulb to prevent the combustion of the carbon.

Either alternating or direct currents can be used, but if the former are applied the frequency should be high enough to eliminate the flicker of the light when the current passes through its zero value.

The ordinary lamps of this kind are usually connected to the generator in multiple and operate at constant voltage, generally about 110 volts. The incandescent lamp used on the 110-volt circuit, rated at about sixteen candlepower, takes a little less than one-half ampere, or about fifty-five watts. The efficiency is therefore about 3.1 watts per candlepower, while the useful life is about 500 hours on the average.

THE METALLIZED CARBON-FILAMENT LAMP.

A few years ago a new type of "metallized" carbon-filament lamp, known as the General Electric Metallized or "Gem" lamp, was placed on the market. Its efficiency is about two-and-one-half watts per candlepower, and its life about 700 hours.

The so-called "metallizing" process consists in heating the filaments to a very high temperature in a carbon-tube electric furnace, both before and after flashing. The filaments then have a positive temperature coefficient, as do metals. It has been well recognized for some years that the illuminating radiation of an incandescent-lamp filament increases with the temperature. Many of the rare metals possessing very high melting points have been studied with the intention of using them for the filaments of incandescent lamps.

The great amount of research work done in this connection has resulted in placing on the market many new types of incandescent lamps, such as those using filaments of tungsten, tantalum, zirconium and osmium. Other metals, such as vanadium and niobium, have been found to possess too low melting points or to

FIG. 125.—TANTALUM INCANDESCENT LAMP.

offer exceptional difficulties in the formation of the filaments.

THE TANTALUM LAMP.

Metallic tantalum has been obtained in the pure state only in the last few years. It absorbs gases readily and can be prepared by heating a filament of its oxide in a vacuum by means of the electric current. It is also prepared by the action of sodium on sodium tantalo-fluoride.

The pure metal is silver white in color and melts at about 2,300 degrees C. It

FIG. 126.—TUNGSTEN INCANDESCENT LAMP.

is as hard as the best steel and when hot can be rolled, hammered and drawn into wire. Its tensile strength is also very high, being considerably greater than that of steel.

When used for filaments in incandescent lamps, the metal is drawn into wire about 0.05 millimetre in diameter. Its resistance is much less than that of a carbon filament, and much longer filaments are consequently necessary when the lamps are used on the ordinary 110-volt circuit.

The tantalum lamp has an efficiency of about two watts per candlepower. Besides showing this high efficiency, it has a useful life of about 700 hours and gives a brilliant white light.

As used for the 110-volt circuit, the lamps take about 0.36 ampere, or forty watts, and produce about twenty candlepower. The size having twice this capacity, called the eighty-watt lamp, seems to be preferable, particularly in alternating-current circuits. The alternating current has a tendency to rupture the slender filaments of the smaller lamps, so that on alternating-current service the useful life is not as great. Sometimes when the filament breaks it can be mended again by tapping the lamp when the current is on, so that the ends come into momentary contact and weld together.

A tantalum lamp, showing the method of stringing the filament, is illustrated in Fig. 125.

The price of this type of lamp is necessarily several times that of the carbon-filament incandescent lamp. However, the tantalum lamps are strong competitors of the carbons, even on alternating-current circuits with half life.

TEMPERATURE COEFFICIENT OF METALLIC FILAMENTS.

A particular advantage of metallic filaments of all kinds is that they have positive temperature coefficients, that is, their resistance increases with increasing temperature. As the voltage increases the current tends to increase, but this results in the evolution of more heat, which produces a higher resistance of the filament. The regulation is thus automatic to a certain extent. This is not the case with the carbon-filament lamp, except for the so-called "metallized" filament, as has been pointed out.

THE TUNGSTEN LAMP.

Tungsten, another rare metal, has been successfully applied to the construction of metallic filaments for incandescent lamps. Its high melting point, 3,050 degrees C., makes it particularly suitable for this type of lamp, and it shows the very high efficiency of from one to one-and-one-half watts per candlepower. Like tantalum, it has a much lower resistance than carbon and much longer filaments are required.

The tungsten lamp can be used equally well on either alternating or direct-current circuits, having a life of about 800 hours in either case. The filaments are somewhat delicate and must be packed and handled with care. The price of tungsten lamps is rather high, but it is to be remembered, however, that their efficiency is about three times that of the ordinary carbon-filament lamp and their life is much longer.

An illustration of a forty-watt tungsten lamp is shown in Fig. 126.

These lamps are also used in incandescent series lighting.

Many tables have been compiled showing the economy of these metallic-filament lamps over the carbon-filament lamps, particularly where the cost of electric energy is rather high.

THE NERST LAMP.

There are certain non-metallic filaments which conduct electricity after having been heated. That is, they are practically non-conductors when at ordinary temperatures, but are fairly good conductors when not. Nernst utilized this property of some of the oxides of rare metals in the construction of the lamp which bears his name.

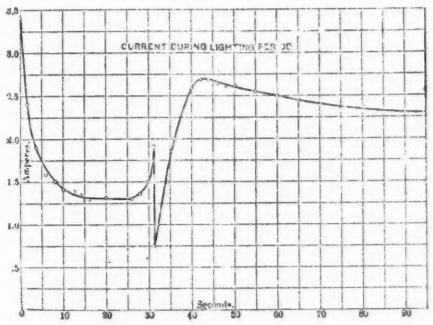


FIG. 128.—STARTING PERFORMANCE OF NERNST LAMP.

The filament in this case is called a "glower." It is made by mixing the oxides of the rare earths with a suitable binding material, passing the dough thus formed through a die and drying the resulting filament. This then has a hard porcelain-like structure and, after being cut into lengths of about one inch, is baked and the terminals are attached.

The glowers, being composed of oxides, are not injured on being brought to incandescence in air; it is not, therefore, necessary to use them in vacuo. After being heated so that the current can pass, the glowers give off a very white efficient light resembling in quality the Welsbach light in many ways.

The conduction of the glower is considered to be of an electrolytic nature and the operation on alternating-current circuits is more satisfactory than on direct-current circuits. Because of the high resistance of the filament these lamps operate readily on 220-volt systems. The arrangement of the various parts of this type of lamp is illustrated in Fig. 127.

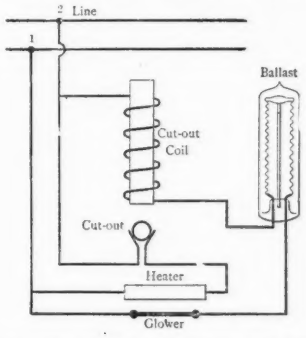


FIG. 127.—STARTING CIRCUITS OF NERNST LAMP.

The glower is connected to the line in series with the cut-out coil and the ballast. In parallel with this circuit is another containing a cut-out and heater, as shown.

The heater is made of fine platinum wire wound on porcelain, and the cut-out is non-oxidizable. Before the current is turned on the cut-out is in the position as shown, so that the current from the line flows through the heater, bringing it to a temperature of from 600 to 700 degrees C., whereupon the glower then becomes a conductor for the current and the heater circuit is broken by the energization of the cut-out coil.

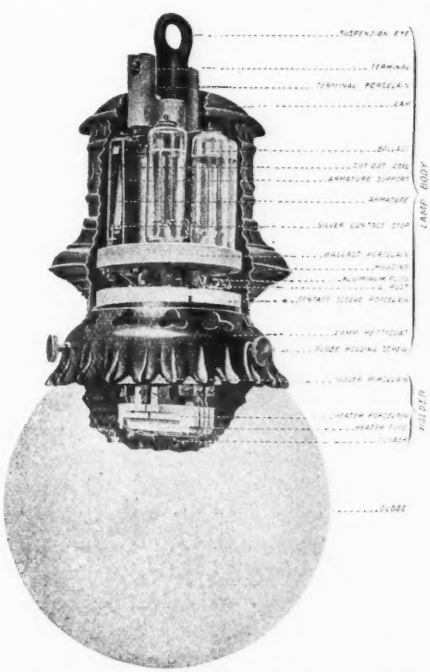


FIG. 129.—THREE-GLOWER NERNST LAMP.

The operations of starting are graphically shown by the curve in Fig. 128, which represents the performance of a six-glower 500-watt lamp. For the first twenty-five seconds the curve indicates only the current taken by the heater. The glowers then begin to take current, and at the end of about thirty-one seconds the sudden drop in the curve shows where the heater is thrown out of circuit; the other glowers are then started from the first two. At the end of forty seconds all the glowers are lighted and the current drops slightly as the ballasts assume their normal running conditions.

The ballasts of these lamps consist of fine iron wire enclosed in an inert atmosphere. The function of the ballast is to counteract the sudden changes in conductivity which the glower undergoes; that is, the ballast acts as a steadying resistance.

A complete three-glower Nernst lamp is illustrated in Fig. 129, where the arrangement of the various parts is clearly shown.

The light given by this type of lamp is a brilliant white and is very pleasing to the eye. As shown, it requires about thirty seconds to light up after the current is turned on.

Railway Signal Association.

The Railway Signal Association will hold a meeting at the Auditorium Hotel, Chicago, Ill., on Monday, March 15. At the morning session, 10 a. m. to 1 p. m., a paper on "Lightning Phenomena," with special reference to signal circuits, will be presented by E. E. F. Creighton, of the General Electric Company.

At the afternoon session, 2 to 4 p. m., there will be a debate on the following question, relating to the work of committee No. 1 on signal practice:

"Resolved, That the scheme of signaling presented at the Washington meeting is the best scheme of signaling devised to date."

New Basis for Shipment of Cedar Poles

Users of cedar poles and ties will be interested to learn that the basis entering into the cost of cedar products has been changed. Heretofore Hermansville, Mich., has been used as a basis for freight rates, but owing to the fact that the centre of the cedar-producing territory is now nearer Rexton, Mich., "Rex" will hereafter be used as the basis by the cedarmen.

THE ELECTRIC DISCHARGE AND THE PRODUCTION OF NITRIC ACID.[1]—IV.

(Concluded.)

BY WILLIAM CRAMP AND BERTRAM HOYLE.

The following is our explanation of the increased output of acid, due to a capacity current flowing across the gap. In the first place, the current across the gap is increased by the presence of such a shunt capacity current; and secondly, ozone is given off in the lower portion of the discharge; and since this is more active than ordinary oxygen, it is reasonable to suppose that more nitrogen will combine than before to form nitrous products.

From this it would seem as though a large high-frequency current, such as we obtained (0.4 ampere, 100,000 to 200,000 periods per second at 4,000 volts), is too high for efficient working, but it is possible that at lower frequencies, such as used by Kowalski and Moscicki (6,000 to 10,000 periods per second), the efficiency may improve again. Similarly by further reducing the frequency it is very likely that the efficiency may decrease again.

In confirmation of the above explanation of the increased output due to the ozonized air coming from the high-frequency portion of the discharge, it may be stated that we have tried an experiment as follows:

The air supply was passed through an ozonizer on its way to a spark chamber which contained the nitrogen flame. When the ozonizer was working, the output of NO_2 from the flame was found to be increased by twenty to 100 per cent, depending on the current, air-blast, etc.

By a spectroscopic examination of an oscillatory discharge, where the frequency is very high and practically pure ozone is being given off, and by then arranging suddenly to switch over to a powerful nitrogen flame, we observe the following prominent and characteristic changes in the spectrum:

1. The distinct red line at the end of the red spectrum disappears, leaving only a slight red band further to the right or blue end of the spectrum.

2. The single yellow line of the oxygen spectrum is eliminated and the two characteristic yellow lines for nitrogen take its place. These lines come conveniently one on either side of the D line for sodium. That the two lines observed were those belonging to the nitrogen spectrum was tested as follows:

When the steady nitrogen flame was running, a speck of sodium salt was inserted into the discharge whilst the yellow part of the spectrum was very closely watched. It was observed that the sodium line D came in very distinctly just between the two yellow lines already existing.

3. When the portion of the oxygen spectrum F to G was observed there was with our spectroscope practically a blank. When the nitrogen flame discharge was switched on, a very distinct band of blue-green appeared just below line F. This line or band is very prominent indeed. Other lines are not so distinct or conclusive since the majority of the oxygen and nitrogen lines are too intermingled, so that the change from the one to the other could only be noted with our apparatus by observing the more prominent lines.

4. It should also be noticed that the nitrogen spectrum never quite disappears when observing the oscillatory discharge, and similarly the oxygen spectrum never quite disappears from the spectrum of the nitrogen flame.

A glass tube of small diameter was inserted into the high-frequency oscillatory portion of the discharge. Gas was then drawn off and tested, and was found to be rich in ozone. By suitably placing the tube in the discharge air mixed with ozone could be obtained, whilst higher up in the same discharge, air mixed with nitrogen oxides was obtained.

From the results of tests taken with cooling devices through which the gases had to pass on their way to the acid-testing apparatus, we conclude that the temperature of the issuing gases (125 degrees C.) is quite high enough to cause considerable dissociation. If the gases be fairly suddenly cooled to about 24 degrees C. after leaving the dome of the apparatus (by being passed through a cooler consisting of a length of about twenty feet of small-diameter lead tube coiled up and immersed in a tank of water at 20 degrees C.), an increased yield may be obtained ranging from ten to twenty-five per cent.

Experiments with a Tesla coil connected to metal plates between which the gases have to pass on their way to the testing apparatus show that an increased output may be expected of from five to twenty per cent in our case, depending upon the conditions existing.

The fact that ionized molecules of oxygen and nitrogen pass through an electrostatic field means that some of the uncombined elements may be forced together with such a velocity that chemical combination takes place between them. In this way an additional amount of peroxide is formed to the extent as stated above, of from five to twenty per cent of that produced in the flame.

It seems then as though (in addition to very rapid cooling of the gases) an electrostatic field applied in such a manner that the gases come into its influence immediately after formation, would help to a large extent to prevent the peroxide from dissociating till the temperature falls to such an extent that further dissociation can be neglected.

AGREEMENT OF THEORY AND PRACTICE.

We shall now proceed to show that the whole of the electrochemical phenomena herein discussed may be explained on recognized ionization and electrochemical hypotheses, but that a considerable amount of work still remains to be done before the exact output limit or proper arc efficiency can be stated. First, then, as regards the form of discharge, we may point out that the pressure-current curve agrees with that theoretically propounded.

When first the potential difference is applied across the points the electric field is very strong near them and very weak near the centre. As a result, any ions produced near the points never reach the centre of the field; and since they are acted on by an alternating field, they are alternately driven out some distance and recalled. An increase in the pressure results in the motion at either pole getting more intense, so that with increased movement of the ions a glow appears at either pole. With further increased pressure the glow extends across from point to point as a double luminous cone, and at this time the velocity of the corpuscles is probably near enough to produce ionization by collision. Further increase in the strength of the field results in not only the production of more ions from either side, but in the more rapid and complete interchange of the ions as they pass from one pole to the other. So soon as the stage is reached when free interchange can take place and when the kinetic energy of the ions exceeds the critical value necessary for ionization by collision, there must be a corresponding reduction of the apparent

1. Abstract of a paper presented before the Manchester (England) Local Section, Institution of Electrical Engineers, November 3, 1908.

resistance of the path. This leads to a formation of brush discharge with the first negative value of $\frac{\delta V}{\delta A}$. The heat of the terminals and consequent increase of corpuscles, with their production in turn of more ions by collision, leads to further reduction in the resistance of the path, so that the current is further increased. So rapid is that, that it accounts for the part of the curve in Fig. 8 marked CD_1. At this point further ionization is assisted by the heat produced, until the terminals themselves probably supply the whole of the necessary corpuscles. When this happens the spectrum shows the character of the material of which the terminals are made, and we call it "the low-tension arc." That ionization is very active in the production of the discharge may be shown by taking a tube of glass and placing it over the nitrogen flame when blown out by an air current. It is seen at once that the glass becomes iridescent exactly as if excited by cathode rays, and further, any gas taken from the flame immediately discharges an electroscope.

Another pretty experiment is that of allowing a jet of steam to cross the path of the electrically produced gas, when condensation is seen to take place where the gas crosses the steam.

We may assume that when electric stress first occurs across an air-gap, the oxygen is ionized before, or to a greater extent than, the nitrogen; and the smaller currents at this period are probably carried by the oxygen ions alone. This leads to the formation of ozone, or to the burning or oxidization of oxygen itself. Thus when the air velocity through the air-gap is high, so that the glow or the brush only exist, the current is probably carried exclusively by oxygen ions, and hence the oxygen and ozone spectra only appear, and the gas smells strongly of ozone.

As the field becomes stronger and ionization by collision ensues, the nitrogen is ionized, and the brush gradually gives way first to the spark (which shows little nitrogen peroxide spectrum), and finally to the nitrogen flame.

The temperature is undoubtedly far greater for this form than for the preceding, and the "body" is greater, for a draught of air hardly affects the ozone discharge, but blows the nitrogen flame about easily. This is explicable both on the ground of the oscillatory nature of the ozone discharge and also from the relatively small proportion of oxygen to nitrogen present.

The above theory is borne out in actual working by the following facts:

1. An electric current which at low air velocities produces nitrous gases will produce ozone if the air velocity is only sufficiently raised, the circuit conditions remaining absolutely unchanged.

2. When the discharge is producing nitrous gases in large quanties at high currents (especially if the electrostatic voltmeter is connected), the lower portion of the discharge is seen to consist of oxygen or ozone (by spectroscopic examination and also the test with the tube).

The agreement of the quantity of gas actually formed with that which theoretically might be ionized under given conditions is very poor. Nor with the present state of knowledge could it be otherwise, for the data available as to the number of ions which may be formed in a cubic centimetre of air have been ascertained for limited temperatures and pressures only, while we are dealing with temperatures probably of the order of 2,000 degrees C. and with enormous pressures.

It is interesting to note that temperature and pressure seem to be interchangeable in these reactions, for with great pressure a Nernst glower will produce peroxide. Possibly, therefore, ionization takes place under great pressure more easily. With regard to this point, we carried out a test with Nernst glowers in a current of air at ordinary pressures, but could not detect any peroxide formed, even though the air impinging on the filaments was ozonized.

The thermo-chemists think that the action whereby the peroxide is produced is neither a purely electric nor chemical phenomenon, but only a thermal action.

Their view is that at all temperatures a combination and dissociation of oxygen and nitrogen take place to an extent depending upon the temperature and increasing with it.

At 3,000 degrees C. there is, in this way, five per cent of the air changed into peroxide, and unless this is cooled extremely suddenly there will be a steady loss of peroxide as the temperature decreases, until at ordinary temperatures the percentage of peroxide present in the air is practically nil. If, however, the cooling takes place very rapidly, the peroxide formed at high temperature will not have time to dissociate, and in this way alone can a large yield of peroxide be obtained.

We conclude that peroxide is formed in the arc by the combined agency of great temperature, great pressure and great temperature gradient; that temperature and pressure may be interchanged, and that it is practically useless to attempt to set a limit to the maximum efficiency attainable till these relations are better understood.

As regards practical deductions, which may be made from the tests described and plotted, we may call attention first to the great importance of adapting gap, current and air blast to one another; for it is evident that changes of yield to the extent of fifty per cent or more may be obtained by slight variations of either factor from the best obtainable.

Again, it may be noticed that as regards quantity of air forced through the flame the maximum acid yield does not for a given current occur at the same point as the maximum acid strength; consequently there is reason to doubt the value of using a magnetic field to spread out the flame. It would appear from rough estimations made on the Birkeland-Eyde process as if the efficiency of this system was such as to lead to the belief that a very good proportion of the maximum possible yield was being obtained. We feel that this is a most important point, for if this be true then it is hardly possible to compete with the cyanamide process in point of view of cost. If, on the other hand, by making use of the most favorable velocity, the most favorable gap-length, the introduction of ozone, the instantaneous cooling of whatever gas is produced, and fixing by subsequent ionizaton, much better yields may be expected, then it is well worth while proceeding on these lines in a large plant with the object of rendering the production of NO more economical.

Reverting now, then, to the creeds of inventors, we think we are justified in saying that those processes which rely on intimate mixing of the air alone, such as Nos. 2 and 5, are not likely to be successful; that it is easily possible to exceed the temperature (or current) at which a given amount of air will give its maximum yield so that it is not of any use to rely on temperature alone; that high frequency is not responsible for a greatly increased yield apart from the presence of ozone (No. 3); and that length and thinness of arc are not of importance unless entailing large current density (No. 4).

We are aware that we have only touched the fringe of the subject, but think that the tests, if taken up where we leave them, will enable the next research to prove more definite.

The Chicago Electric Club.

At the midday meeting of the Chicago Electric Club on Wednesday, March 3, A. A. Gray, managing editor of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, addressed the members on the subject of "Publishing a Technical Journal." Mr. Gray described briefly the various departments into which the work of publishing is divided and indicated the relationship of the different elements in the publishing organization. He described the methods by which contributions are secured, and explained the mechanical details through which the copy passes from the hands of the editors to the printers. The methods used in preparing illustrations for reproduction, the processes of zinc and copper-plate engraving and the electrolytic process of wax engraving and electrotyping were also described.

The functions of the high-class technical journal were discussed and the important part which these journals had played in the upbuilding and development of the industries with which they were connected was emphasized.

In opening the discussion, Frank L. Perry spoke of the relation which must exist between the editorial and the advertising departments, and stated that the editor must above all preserve the balance between the advertiser and subscriber. He must also use restraint and exercise constant vigilance that the reading columns may not be imposed upon either by ambitious solicitors or unfair manufacturers. He showed the importance of utilizing the strong technical journals as a medium for bringing before the best class of readers the products upon the disposal of which the success and profit of the industry depend.

George Cutter, of South Bend., Ind., stated that it was a pleasure to him to indorse Mr. Perry's remarks and said that he had long ago come to the conclusion that the technical journals had been of inestimable service in bringing to the attention of those interested and requiring the information the most interesting discoveries and the vital points in development which had made it possible for science to advance so speedily.

F. A. Sager, of Chicago, said that an engineer must look to the technical journals to keep him informed of the trend of events, and that if he left off reading his technical journals for only a few months he found himself entirely out of touch with current development. Engineers, he said, should be consistent in their efforts to lend support to the leading technical journals.

J. R. Cravath, western editor of the *Electrical World,* said the technical journal was, first of all, a medium for disseminating the best information available for the education and edification of its readers, and secondly, was a medium for introducing to those who desire such information the products of the manufacturers in that industry. The value of the technical journal to both subscriber and advertisers in the long run would be based upon the standards which the publication maintained, and it was to the end that these publications might prove of the greatest value to the industry that Mr. Cravath suggested that readers and manufacturers alike seek from the technical journal only that service which could be indorsed as being of a character above reproach.

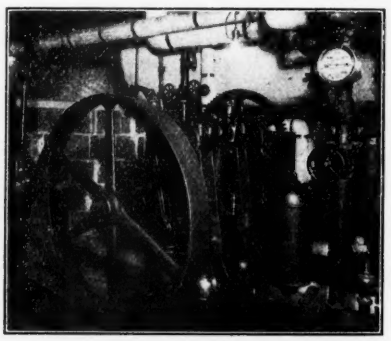
Wm. E. Keily, Chicago, spoke very gracefully upon the functions of the editor and indicated the opportunity and the vast amount of work which is the part of the technical journal and its personnel in meeting the requirements of its greatly varied classes of readers. He likened the editor of the technical journal to a chef who was constantly busy trying to please a myriad of appetites, and one who must be ever alert to secure for his readers just that information which applied to their particular lines of thought. He said that in every issue of a technical journal there should be some material of value to every reader, and the test of the success of a technical journal would depend upon its ability to include just this material.

Albert Scheible, Chicago, raised the question as to whether the technical journals, and particularly the electrical journals, were making any effort to secure subscribers who could make adequate returns for the money spent by advertisers in the advertising pages.

In replying to this question, Mr. Gray stated that a visit to the publication office of any decent journal would indicate that the circulation department was one of the busiest in the organization, and that in this department there was being made a conscientious effort to secure the cooperation and constant attention of not only the casual reader, but particularly the man who had the purchasing power in every line of endeavor. The methods used to secure increased circulation were also discussed.

The Tailoring Factory of Hirsh, Wickwire & Company.

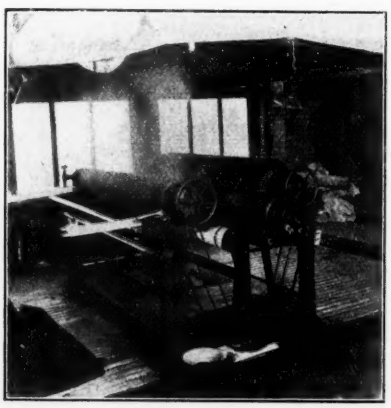
The new building of Hirsh, Wickwire & Company, manufacturers of clothing, at the corner of Franklin and Van Buren streets, Chicago, occupies a ground area 100 feet by 150 feet, and is ten stories high. With the exception of a portion of the lower floors used for office tenants, this building is occupied by the tailoring company for manufacturing and distributing its lines of clothing. The power,



MOTOR-DRIVEN PUMPS IN THE POWER PLANT OF HIRSH, WICKWIRE & CO.

heat and lighting services for the building are furnished by an isolated plant, located on the basement floor.

The electrical equipment is operated on a direct-current three-wire system, 110 volts on a side. There are two generators, one 150 kilowatts, at 150 revolutions

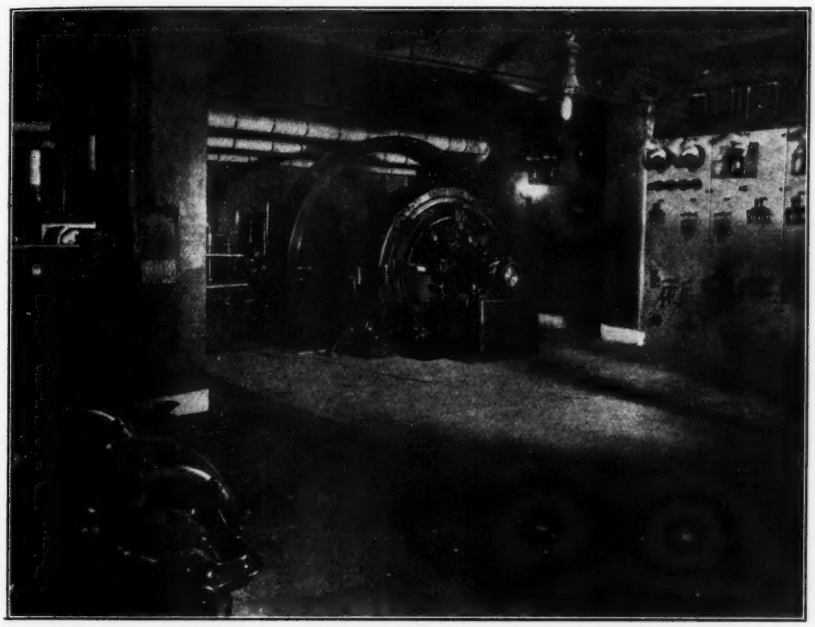


MOTOR-DRIVEN STEAM SPONGING MACHINE, HIRSH, WICKWIRE & CO.

per minute (shown in an accompanying view of the engine room) and the other, seventy-five kilowatts, at 275 revolutions per minute. These generators were built by the Northern Electrical and Manufacturing Company and operate at 250 volts. There are two compensator sets on the three-wire system, built by the same company. The two engines were supplied by the Ball Engine Company, of Erie, Pa.

The larger of these is a four-valve, simple type, and the smaller is a single-valve, high-speed engine.

Steam is provided by three horizontal tubular boilers, sixty-six inches by sixteen feet. These boilers are of the triple-riveted butt-strap design, and carry 125 pounds pressure. They are equipped with Burke furnaces. The boilers are set in a concrete pit, waterproofed with hydrolithic cement, and with the floor three feet below the drainage level. The boilers and breeching were supplied by Kroeschell Brothers. There is a steel stack in the boiler room surrounded by a square brick duct, the latter ventilating the boiler room itself.



ENGINE ROOM OF THE PRIVATE POWER PLANT OF HIRSH, WICKWIRE & CO.'S TAILORING FACTORY, CHICAGO.

The plant is provided with a Cochrane open feed-water heater and receiver and with two steam feed pumps. There is a motor-driven triplex house pump, motor-driven sprinkler pump and motor-driven air compressor. These machines are shown in a photographic reproduction herewith. The sub-soil drainage is handled by means of a Yeoman's ejector. The basement also contains four electric elevator machines built by the Reedy Elevator Company, and one fan used in connection with the shrinking of canvas, driven by a Northern commutating-pole motor with 100 per cent speed variation.

LINE OF MOTOR-DRIVEN SEWING-MACHINES IN THE TAILORING FACTORY OF HIRSH, WICKWIRE & CO., CHICAGO.

The factory is equipped with direct-connected sewing-machine motors operating at 420 revolutions per minute. The manner of arranging and controlling these machines is clearly illustrated in the view of a sewing-machine group on this page. These motors are of the Diehl type. There are also motors of a small fraction of a horsepower capacity used on the various knife cutters.

The steam sponging machine, shown in one of the illustrations, is driven by an electric motor. This sponging machine, used for shrinking goods before the material is made up, comprises hollow perforated rolls on which a bolt of cloth is wound. Live steam at eighty pounds, obtained from the 125-pound boiler mains through a reducing valve, is then turned into the rolls, which are meanwhile rotated by the motor.

The lighting of the factory floors is entirely by means of incandescent lamps. Sixteen-candlepower carbon lamps are used in general, while tungsten lamps are employed in the sample rooms and in parts of the cutting room. The sewing machines are each provided with a flexible lamp bracket and deep reflector. The lighting of the cutting and pressing tables and the general illumination is secured mainly by the use of Benjamin clusters and reflectors. The wiring work was installed by Kohler Bros., Chicago.

The heating installation is provided with a down-feed system and uses direct radiation throughout. Exhaust steam is sufficient to take care of the building except during extreme weather. Heating and power piping was furnished by Kehm Bros., Chicago.

The switchboard is provided with Weston indicating and Duncan integrating instruments, the generators being protected by means of I. T. E. time-limit circuit-breakers. The switchboard was built by Kohler Bros. A Stromberg-Carlson intercommunicating telephone system connects all floors of the building.

The mechanical and electrical equipment was installed under the supervision of W. L. Fergus & Company, consulting engineers.

Electrical Notes from Great Britain.

(By our British Correspondent.)

The reports of some of the underground electric railroads, which have just been issued, show that some of them profited largely by the special traffic induced by the Franco-British Exhibition, and as it has now been definitely decided to continue the White City at Shepherd's Bush for the corresponding months of this year as an Imperial International Exhibition, they are hoping for a repetition of this good traffic. But there are certain tube lines which could not expect to gain from such an event, and one of these is the Great Northern and City tube, running out from Moorgate (city) to Finsbury Park in the north of London. This unfortunate undertaking has had a most unhappy half-year, and is deserving of all the sympathy that it can evoke, for it has lost about one-third of its traffic through competition of municipal electric tramways at very low fares. This reduced its income to such an extent that it was only by means of help from outside sources that it was able to pay its expenses. Its directors want to extend the tunnels a short distance into the city so as to meet the city-leaving traffic before it reaches the tramway terminus.

The chief point of interest concerning the City & South London (an incorrect title now, seeing that since it was named it has pressed outward to the north at Islington and Euston) lies in the measures that are in course of adoption for securing greater safety as regards fire prevention. Last year, it may be remembered, a fire occurred near one of the stations, in a tunnel, setting ablaze certain material beside the track. As a result of the Board of Trade inquiry that followed, works costing about $50,000 have been undertaken, these including the filling up of the inverts or deep hollow spaces underneath the rails and platforms in those parts of the tubes which were built of larger diameter in order to provide room for the stations and their signal boxes, sidings, etc. It was considered that inflammable substances were likely to lodge in these "inverts," giving rise to fires in inaccessible places. They will now be filled up to the rail level with uninflammable ballast. Station platforms of stone or slate will take the place of those of wood, and similar changes will be introduced in the case of certain signal boxes and other like structures.

The Metropolitan reports very satisfactory results from the increased and improved service of trains introduced last October, and claims to have now attained to a punctuality such as has not existed since the introduction of electric traction. This will be further assisted by the installation of automatic signaling on the inner circle, the last section of which is now about finished. It is noteworthy that the directors have greatly increased their allocation to electrical renewals and depreciation fund, the reason being that "in electrical machinery, and turbines especially, cost-saving improvements were continually being made, and it might be necessary for reasons of economy before the present machinery was anything like worn out, to supersede it by something more up-to-date and efficient.

The Metropolitan District, by the help of the exhibition and other things, increased its revenue during the past half-year by $190,000, while its expenses decreased by $11,000. The increase in passengers carried was twenty-two per cent; that in passenger receipts 18.66 per cent, while the train mileage advanced by twenty-four per cent and the car mileage by 16.54 per cent.

The East London Railway is sadly in need of improvement, and its only chance of salvation lies in electrification. Everybody associated with it in any way recognizes the truth of this, but other companies have a say in the matter, and the time for the change is not yet at hand. Lord Claud Hamilton, its chairman, had some interesting remarks to make on the general position of electric traction the other day, the essence being that when the single-phase line of the London, Brighton & South Coast Company has been running a sufficient length of time, we shall know more to guide us as to the relative merits of alternating-current and direct-current methods of working. In England, he remarked, although the electric working of railways was much appreciated by the public, its extension was very tardy. There must be some good reason, and he suspected it was that electrical working on the low-tension direct-current system, as compared with steam, had proved too costly in English practice.

The London Electric Supply Corporation which, as has already been mentioned in the ELECTRICAL REVIEW, furnishes energy for working the London-Brighton single-phase line, has entered into a seven-year contract for this undertaking, and the minimum consumption agreed upon for this particular train service is 4,000,000 units per annum. It is satisfactory to be able to report that this corporation is greatly improving its position. Nobody will grudge it a period of success, who remembers how disastrous and heart-breaking was its uphill and pioneering task close upon twenty years ago, when, at its Deptford station, the celebrated Ferranti high-tension experiment was in progress. Like all the other electric supply companies of London whose annual reports are just appearing, the corporation is pleased to be able to chronicle a termination to the London power-bill fight. The feelings of the companies were described by one of their chairmen in these terms: "The idea is exploded that cheap power can be made by act of Parliament, and that if electrical companies pay big dividends it necessarily means dear power and the consumers' loss." The speaker hoped and thought that now "the policy of taking care of the consumer at the expense of the producer was abandoned in the electrical industry once for all, and that they would henceforth be free to make fair dividends until 1931, and then hand over a group of prosperous undertakings to the London County Council without any loss of capital being inflicted on shareholders."

It is interesting to hear it stated that just about $2,500,000 has been expended on the promotion of London bulk schemes since the agitation began. R. H. Benson, chairman of the London Electric, measuring the damage to the credit of the electrical industry by the fall in the stock-market quotations of the seven principal London companies from 1904, just before the movement commenced, down to 1908, says that the depreciation was in four years forty-eight per cent, or a fall from thirty-one-and-one-half million dollars to sixteen-and-one-half million dollars.

The top-covered tramcar seems to be very much in favor with the citizens of Glasgow, as it is in many other large cities here. Out of a total of 900 trolley cars, there are 500 either fitted or being fitted with such covers. Seventy have recently been finished, and a further 110 are about to be taken in hand, making

the 500. The after-effects of the snowstorm, to which reference was made in my last monthly letter, seem to have been of some seriousness in a number of places. At Glasgow, for instance, through snow and salt getting into the motors, as many as 120 cars had to be taken off duty, and the engineer has now been requested to report on the possible encasing of the motors to avoid such damage in future.

One of the most important effects of recent years' legislation in the direction of workmen's compensation is one that was probably unexpected by many who thought they were doing a grand thing for our "working classes" when they secured provisions for compensating men and women for almost any conceivable accident. We refer to the increased care, alertness or efficiency that is required on the part of the employe, and will be more and more called for as time goes on. An interesting case bearing upon this point has just been settled, where a Durham colliery workman, who was engaged to look after an electric coal cutter, has been prosecuted for infringing the rules of the colliery. It was part of his duty to see that the electric cable, which worked on a drum, was kept clear of the machine, but one day he allowed the cable to get under it, with the result that the insulation was torn off, and he received a nasty shock, which flung him upon his machine and has since rendered him incapable of following his employment. By the colliery management the accident was attributed to carelessness rather than willful disobedience. The fact that the workman had already suffered severely excited the sympathy of the magistrates, so that he was let off without any further penalty than the payment of the costs; the case was not pressed by his employers. The publicity given to the affair will perhaps have a healthy effect, reminding employes they have not only privileges in their employment, but obligations to which, for non-fulfillment, penalties are attached.

One of the very few new public generating stations that are now in course of erection in England is that planned by the borough electrical engineer of Stepney (London) for supplementing its existing sources of supply. Ultimately the new plant will consist of two 1,000-kilowatt, four 2,000-kilowatt and three 6,000-kilowatt alternator sets, with twenty-three marine type boilers fed by chain grate and underfeed stokers. In the first instance, however, there are to be put in, by the end of the coming summer, two 1,000-kilowatt and two 2,000-kilowatt Parsons type turbo-generators running at 1,500 revolutions per minute; the 1,000-kilowatt sets are now temporarily installed in the Council's other station at Whitechapel, and they consist of two 500-kilowatt generators in tandem, to supply both direct and three-phase current. Coal will be taken from barges to the wharf by an electric grab, a continuous bucket conveyor taking it on to the bunkers. At its existing station the Stepney Council is installing experimentally a "fumicide" smoke-prevention apparatus.

"Electrically Driven Brass and Copper Rolling Mills" was the title of a useful paper read by C. A. Ablett before the Birmingham Association of Mechanical Engineers, in which he gave an account of the methods of driving rolling mills for brass, copper and such metals. The various advantages of converting a steam-driven mill to electric driving were fully discussed; they are these: economy of working, saving in space, greater production from the existing plant, greater reliability and freedom from breakdown, easy extension, power taken can be easily and continuously checked. It was stated that most existing layouts of mills are entirely settled by considerations of gear driving from the steam engine, and in some electrical mills such a layout has been imitated. In laying out an electrically driven mill the considerations are the best positions of the rolls with regard to the position of the casting shop and muffles, and to avoid as much carrying about of the metal as possible; also the best utilization of the space to be disposed of. Mr. Ablett gave a description of a large reversing cogging mill which was installed by Siemens over a year ago at Georgs-Marien-Hutte. It is driven by a 7,000-horsepower motor, and rolls ingots of about twenty-three inches square section and five tons weight. The rolls are thirty-five-and-one-half inches in diameter, and the out-turn, running at sixty revolutions per minute, is sixty tons per hour. The motor can be reversed from sixty revolutions in one direction to sixty revolutions in the other twenty-eight times per minute. An Ilgner converter set driven by a 1,300-horsepower motor running at 340 to 450 revolutions per minute supplies the power; the power of the main rolling motor is continually varying from zero to 7,000 horsepower, yet the power taken from the generating station is maintained by the converter set at the steady value of 1,300 horsepower. Much larger reversing-mill installations have since been put down by the Siemens company, notably at the Rhine steel works.

The most important paper that has so far occupied the attention of the London meeting of the Institution of Electrical Engineers is that by Leonard Andrews and Reginald Porter, on the use of large gas engines for generating electric power. Some of the material given was based on a recent visit by one of the authors to the United States. The authors, while believing that there is an important field for the use of large gas engines for driving electric generators, do not consider that there is at present justification for the suggestion that has been made, that the internal-combustion engine will, in the early future, be used to the exclusion of the external-combustion engine.

Where both the cost of fuel and the load factor are low, it will generally be a mistake to use gas engines, but where they are high, there can be no doubt, said the authors, that gas engines will prove to be by far the cheapest prime mover to employ for driving electric generators. Between these two extremes, the majority of cases will doubtless fall, and engineers for the design of future power houses will have many points to consider before definitely deciding whether the prime movers for the electric generators shall be steam or gas driven, or a combination of the two.

Dr. Chree, F. R. S., delivered his presidential address to the Physical Society of London on February 12. At the following meeting Prof. S. P. Thompson, F. R. S., gave an exhibition of optical properties of combinations of mica and selenite films (after Reusch and others) in convergent polarized light. He also, in conjunction with E. W. Moss, contributed a paper on the self-demagnetizing factor of bar magnets. Charles R. Darling placed on exhibition a simple form of thermo-electric pyrometer for students' use; a combined metre bridge and potentiometer, with a new tapping-key device, for pyrometric and general laboratory work; and a new form of carbon-plate rheostat, suitable for the control of small electric furnaces.

G. L. Addenbrooke has just delivered before the Royal Society of Arts in London a series of lectures on the public supply of electric power, and before the same society Leon Gaster is now giving a series on "Artificial Methods of Illumination."

ALBERT H. BRIDGE.

London, February 27.

Annual Meeting of the New England Association of Gas Engineers.

The thirty-ninth annual meeting of the New England Association of Gas Engineers, the mother of the gas associations of this country, was held at Young's Hotel, Boston, Mass., on February 17 and 18, with well over 150 members and guests in attendance.

The president, Walter G. Ofrica of Manchester, N. H., called the meeting to order, and the secretary, N. W. Gifford of East Boston, announced the papers to be read as follows: "Street Lighting," "Tar for Roads," "A Comparison of the Enriching Values of Benzole and Gas Oil," "Some Results of the Use of Steam and Air Meters in the Water Gas Plant," "The Comparative Practical Efficiency of Various Types of Gas Lamps," "Why the Gas Man Should Be an Illuminating Engineer," and "Calorimetry."

Of the seven papers, four were devoted to manufacture, one to the use of residuals and three to illumination. The fact that such a large proportion of the programme was devoted to the subject of lighting is sufficient indication of the increasing interest being taken in that end of the business.

In addition to the regular papers there were some dozen questions discussed from the Question Box covering a wide range of subjects.

The president's address was principally concerned with sales per capita, the use of vertical retorts and the commercial side of the business.

PAPERS ON LIGHTING.

The paper "Why the Gas Man Should Be an Illuminating Engineer," was presented by Norman Macbeth, of the Welsbach company, and it may be interesting to "See ourselves as others see us." Comparing gas with electricity, he stated:

"More talking points should be built about quality; not, of course, neglecting price, but using favorable cost comparisons more as good measure to finally clinch the argument. On an installation in a store, the order for which was closed recently, the proprietor was somewhat taken aback by the claims I brought to his notice on what gas could do for him in giving him more and better illumination than he could secure with the tungsten lamps he proposed to use. The first costs were about equal, the gas fixtures, if anything, had the better appearance, and he was giving the proposition a somewhat serious attention when the final question arose: "What is this going to cost me per hour to run twelve inverted burners with gas at eighty cents; 2.9 cents per hour, $29 per 1,000 hours, or twelve sixty-watt tungsten lamps at twelve cents per kilowatt, at 8.6 cents per hour, or $86 per 1,000 hours ($29 to $86, one-third the cost)?" This installation had received practically equal consideration from the standpoints of appearance, convenience and service, but when maintenance costs were considered it was not necessary to dwell on the increased advantage of gas because of the maintenance service which could be afforded to insure the higher efficiency over that of tungsten. Glassware and accessories cleaned regularly insured an increase in average illumination of twenty to thirty per cent over the electric, even assuming the initial installation of each to be on a par at the start. Those familiar with electric incandescent lamps and glass reflectors acknowledge these percentage losses, where cleaning and washing is not regularly attended to.

"Do not exaggerate the advantages of gas illumination. You don't have to, and I would much rather sell gas with a liberal discount of its fitness and illumination possibilities than describe it fully and exactly. A customer who feels that his purchase is better than he anticipated will do more for you and go farther out of his way to get or give more business to you than one who may have been strongly canvassed and had his enthusiasm brought to a white heat point.

"Little has been said in the past about candlepower depreciation in mantles, and I have some figures here which were secured from tests of mantles of medium good quality. The efficiency from the initial to 100 hours shows a drop of eleven per cent; at 250 hours, 12.8 per cent; at 500 hours, 27.2 per cent, and at 1,000 hours thirty-three per cent. This, by the way, is not greater than the depreciation in electric lamps by dust alone. Mantles from similar stock when subjected to tests on a bumping machine withstood an average of 1,191 bumps.

"It would undoubtedly be a valuable addition to gas illumination if we could have mantles which were specially made to hold their candlepower as well as their ability to withstand shock.

"The day is now nearer than ever before when gas companies will demand just such a mantle. From the standpoint of selling gas by the cubic foot, a mantle which would stand up and give a fairly long life was not asked to hold up in candlepower.

"When it comes to selling illumination, however, it is necessary that the candlepower depreciation be known and be considered. I can state that we can shortly look for mantles which can be guaranteed to not exceed a drop of three per cent in 1,000 hours or ten per cent in even 4,000 hours. Tests have been made and these results have been secured."

The paper on "Street Lighting," by Edwin Garsia, of the Welsbach Street Lighting Company, did not bring out any novel points nor give any methods by which the service could be improved, but the members who discussed the paper thought differently. J. B. Klumpp stated that with the tungsten incandescent and the flaming arc as competitors that many strides would have to be made to hold the business, and suggested high-pressure gas lamps. H. Thurston Owens stated that tungsten lamps had demonstrated the value of reflectors and that gas lamps, especially of the inverted type, were well adapted to their use.

A. R. Burr described briefly the method of lighting and extinguishing by means of pressure waves at New Haven, where the lamps were located over four miles from the works.

The third paper on lighting, entitled "The Comparative Practical Efficiency of Various Types of Gas Lamps," was read by R. C. Ware, of the Boston Consolidated Gas Company. The principal points brought forward were as follows:

"Although there have been numerous and exhaustive researches regarding the practical efficiency of the electric lamps in common use, there has not, to my knowledge, been any similar work to determine the actual rating of the different types of gas lamps, and of the same lamp with different glassware. That is, we have distribution curves worked out, and tables giving comparative consumption and maximum candlepower per cubic foot, or mean spherical candlepower per cubic foot, etc.; but regarding the practical application of the lamps there is little data.

"I have, accordingly, worked out some rough calculations along this line which may be of interest. I wish here to express a very lively appreciation of the valuable paper contributed at this year's convention of the Illuminating Engineering Society by Messrs. Cravath and Lansingh, on 'The Measurement of Illumination by the Flux of Light Method.' This will be found useful for rapid determination of the number of lamps required for a given area and specified illumination.

"I should explain that the results described below are, at best, very rough, and since they were reached purely by calculation and not by actual test, there is likely to be some variation from conditions obtained in actual practice.

"I have chosen for the problem a rectangular room 50 by 30 feet and 12 feet high. This space is sufficiently large to allow the lamps to be so placed, if desired, that where reflectors are used the main flux of light shall be directed entirely at the floor and shall not reach the walls. The plane of illumination is three feet above the floor, and the average illumination to be secured is three foot-candles for the whole area. This intensity is pretty generally agreed upon as being a mean which suits most ordinary purposes. It is the usual upper limit for churches, auditoriums, general merchandise stores, etc., and it is the usual lower limit for bookkeeping, desk work and draughting purposes. There is, therefore, an area of 1,500 square feet requiring a supply of three lumens per square foot, or 4,500 lumens in all—one lumen being the amount of light required to give an intensity of one foot-candle over a surface of one square foot at a distance of one foot.

"Applying the flux of light method, described by Messrs. Cravath and Lansingh, to determine the number of effective lumens given off by the various burners under consideration, we get the results shown in the following table. I have taken the effective angle of illumination for general lighting of the nature under consideration as sixty degrees above the vertical. At the usual height of a chandelier of about seven feet above the floor, or four feet above the plane of illumination, light given off at this angle will strike the plane at a distance of about seven feet. This angle is possibly somewhat low for the consideration of light sources of high candlepower, but for the consideration of the lower-powered lamps the light given off above sixty degrees would not play a very large part in the direct illumination. It should be noted, however, that in the case of a large room it is not safe to disregard entirely the direct light given off above this angle, as the total amount of such light coming from many lamps at a distance adds materially to the illumination at any given spot. For the more common problem, however, of a room of only moderate proportions the angle stated is probably sufficiently correct.

"It should be further noted that in all unshaded lamps, except the inverted mantle burner, the maximum intensity of light is given off at about the horizontal. Where the walls of a room are dark so that reflection from them is missing, it is, therefore, necessary to utilize these powerful rays by means of suitable shades to as great an extent as may be possible.

"In the table there are given two cases, one showing the number of lamps required for the given room where both ceiling and walls are dark so that only the direct illumination is utilized. This condition, with absolutely no reflection, is, of course, almost purely theoretical, and is seldom met in actual practice. Under the second case are given the lamps, etc., required for the same illumination in a room with light ceiling and walls."

Room 50x30 feet. 12 feet high. 1,500 square feet. Intensity, 3 foot-candles.
Plane, 3 feet from floor. Effective angle, 60 degrees.

Type of Burner.	Effective Light Below 60° Lumens.	Light Above 60° Lumens.	Mean Spherical Candlepower.	Consumed Cubic Feet.	Case 1—Dark Room. No. of Lamps.	Total Cubic Ft. per Hour.	Total Effective Lumens per Cubic Foot.	Cubic Foot per Foot-Candle per Square Ft.	Case 2—Light Room. No. of Lamps.	Total Cubic Ft. per Hour.	Total Effective Lumens per Cubic Foot.	Cubic Foot per Ft.-Candle per Square Foot.
Open flame	65	186	20c.p.	5.0	69	345	13.0	.0767	40	200	22.2	.0444
Upright Lamp—												
Bare mantle	119	672	63	3.7	38	140	32.2	.0311	16	59	77.5	.0131
"Q" Globe	137	430	45	5.0	33	165	27.4	.0367	18	90	49.0	.0200
Opal dome and Bobesche	212	283	39.4	3.6	21	76	58.9	.0169	16	57	78.6	.0127
Fluted flat reflector	183	528	56	3.7	25	92	49.5	.0204	14	52	85.1	.0116
Inverted lamp—												
Bare lamp	272	507	62	3.22	17	55	84.5	.0122	11	35	123.9	.0078
Ground glass	226	420	51.5	3.0	20	60	75.3	.0133	13	39	110.3	.0087
Holophane dist reflector	446	200	51.5	3.22	10	32	138.5	.0071	9	29	154.0	.0064
Arcs—												
4-burner upright gas arc	1,090	1,910	239	19.0	4	76	57.0	.0169	3	57	82.5	.0127
3-burner inverted gas arc	890	1,838	217	11.0	5	55	81.0	.0122	3.3	36	123.0	.0080

The data given should prove of value for the purpose of comparison with proposed electric installations.

THE BANQUET.

The banquet, which was held on the evening of the first day's session, was attended by the full quota of members and guests, but was not graced by the members of the fair sex.

Few of the speeches were in a serious vein, and that goodfellowship which goes hand in hand with long association was everywhere in evidence.

Among the speakers were Charles F. Prichard, president of the American Gas Institute; J. D. Shattuck, president of the National Commercial Gas Association; Henry L. Doherty, past-president of the National Electric Light Association; O. H. Pillsbury, ex-attorney-general of Massachusetts, and James L. Richards, president of the Boston Consolidated Gas Company.

The present officers were re-elected, it being the custom to thus increase the term of office to two years instead of only one.

Electrical Engineering Society of Columbia University.

On the evening of March 5 P. S. Millar, of the Electrical Testing Laboratories, New York city, delivered an address before the Electrical Engineering Society of Columbia University upon the subject of "Photometry." Numerous slides were used to illustrate the subject-matter, which covered spectrum analysis, the physiological factor of visual acuity, types of photometers and lamp testing.

Mr. Millar stated that with our modern artificial light sources only from two to fifteen per cent of the energy was available for the purpose of illumination. Referring to the yellow flaming-arc lamp, he stated that red and green predominated but that these combined to form yellow.

Curves were shown illustrating the three factors most troublesome in individual work in photometry: Color blindness, intensity and the angle of vision.

Beginning with the Rumford, the speaker described the various forms of photometers, including the Bunsen, Lummer-Brodhun, flicker, Albrecht sphere, mirror and Matthews. He did not believe that the balance obtained with a flicker photometer was essentially of the correct photometric value.

Announcement was made that a special course in lighting was soon to be started under the direction of Prof. H. C. Parker.

Chicago Section, Illuminating Engineering Society.

The Chicago Section of the Illuminating Engineering Society is making a poll of its members as to their sentiments upon the question of holding the April meeting at noon rather than in the evening, as heretofore. All members should make their opinion known to the secretary, George Harvey Jones, 139 Adams Street, Chicago, as soon as possible.

FINANCIAL REPORTS OF ELECTRICAL COMPANIES.

ROCKY MOUNTAIN BELL TELEPHONE.

The Rocky Mountain Bell Telephone Company reports for the year ended December 31, 1908, as follows:

	1908.	1907.
Gross	$1,698,141	$1,561,797
Expenses	1,488,146	1,516,255
Net	$ 209,995	$ 45,542
Interest charges	314,992	.....
Deficit	$ 104,997	.....

The company now has 42,495 stations installed, a slight increase during the year. Expenses were heavily charged for deferred maintenance during the year, so that the showing cannot be called a normal one. The company has $8,580,792 of assets and a floating indebtedness of $5,865,280.

GRAYS HARBOR RAILWAY AND LIGHT.

The report of the Grays Harbor Railway and Light Company for the year ended December 31, 1908, compares as follows:

	1908.	1907.
Gross	$205,978	$193,743
Expenses and taxes	118,823	105,272
Net	$ 87,155	$ 88,471

TORONTO RAILWAY.

One of the best traction reports is that of the Toronto Railway Company, which in a year of depression in sympathy with the conditions prevailing in the United States increased its gross earnings and reduced its operating expenses. As a result, net earnings were the largest in its history.

The Toronto lines show evidence of the most efficient kind of management. With heavy charges imposed by the city in return for the use of its streets, the company nevertheless managed to meet all expenses, maintain the property in excellent style, take care of its bond interest and earn a surplus of 11.8 per cent on its $8,000,000 of stock. The surplus of $947,198 was sufficient to pay the regular six per cent dividend and leave a balance of $467,685.

There was paid to the city in 1908 $578,995 out of the total earnings of $3,566,493, or sixteen cents out of every dollar paid in by passengers. Of this sum, $81,158 was on account of pavements and $50,439 for taxes, but the remainder, $447,397, was a direct toll collected on fares taken in. During the term of its franchise the company has paid the city of Toronto a total of $4,609,785.

A summarized statement of the income account for the past two years makes the following comparison:

	1908.	1907.
Gross	$3,610,273	$3,511,198
Operating expenses	1,889,046	1,893,236
Net	$1,721,226	$1,617,961
Operating ratio, per cent	52.9	53.9

Since the close of the last year business has improved and the prospects for another good report are very favorable. In the month of January, 1909, gross earnings were $18,600 ahead of that month of 1908.

Toronto Railway's income account for the year ended December 31, 1908, compares as follows:

	1908.	1907.
Gross	$3,610,274	$3,511,198
Expenses	1,889,047	1,893,138
Net	$1,721,226	$1,617,960
Charges	774,028	721,802
Surplus	$ 947,198	$ 896,158
Dividends	379,514	473,387
Surplus	$ 467,684	$ 422,771
Contingent accounts	150,000	125,000
Net surplus	$ 317,684	$ 297,771

The surplus available for dividends, $947,198, is equal to 11.84 per cent earned on the $8,000,000 capital stock.

The company paid the city of Toronto in 1908 $578,995, an increase of 210 per cent in the last decade. Since the inception of the company in 1891 it has paid into the city treasury $4,609,785. Freight and express earnings continue to improve and show a gain of 23 per cent over the previous year.

NIAGARA FALLS POWER COMPANY.

The annual report of the Niagara Falls Power Company and the Canadian Niagara Power Company for the year ended December 31, 1908, is issued. The combined income account for the year 1908 compares as follows:

	1908.	1907.
Gross	$1,681,941	$1,683,223
Expenses	442,617	447,076
Net	$1,259,324	$1,236,147
Other income	88,704	162,535
Total income	$1,348,028	$1,398,682
Fixed charges, etc.	1,190,737	1,188,009
Surplus	$ 157,291	$ 210,673

AMERICAN GAS & ELECTRIC.

The American Gas and Electric Company's comparative statement for the quarter ended December 31, 1908, shows as follows:

	1908.	1907.
Gross earnings	$652,364	$540,362
Expenses, taxes, charges, etc.	469,054	356,570
Net income	$183,310	$153,792
Net expenses, A. G. & E.	15,259	32,947
Net income	$168,050	$120,844
Interest, 5% col. gold bonds	78,525	78,525
Dividend on preferred stock	23,006	19,856
Surplus	$ 66,519	$ 22,463

AMERICAN DISTRICT TELEGRAPH OF NEW JERSEY.

The American District Telegraph Company of New Jersey has issued a report of operations for the calendar year 1908 (December estimated), which compares with the actual returns for the year 1907 as follows:

January 1 to December 31:

	1908.	1907.
Gross earnings	$3,192,000	$3,017,174
Expenses	2,407,000	2,304,214
Net earnings	*$ 785,000	$ 712,960
Dividends	398,088	396,899
Surplus	$ 386,912	$ 316,061

*Balance for dividends shows 7.91 per cent earned on the $9,909,850 capital stock outstanding.

The company paid its twenty-fourth consecutive quarterly dividend on January 22, 1909.

TOLEDO RAILWAY AND LIGHT.

The report of the Toledo Railways and Light Company, for the month of December and twelve months ended December 31, compares as follows:

Month of December:

	1908.	1907.
Gross	$ 235,974	$ 226,034
Operating expenses	120,356	124,007
Net	$ 115,618	$ 102,027
Other income	93	835
Total income	$ 115,711	$ 102,862
Charges and taxes	72,125	68,604
Surplus	$ 43,586	$ 34,258

January 1 to December 31:

Gross	$2,538,633	$2,554,290
Operating expenses	1,377,021	1,455,503
Net	$1,161,612	$1,098,787
Other income	3,477	10,910
Total income	$1,165,087	$1,109,697
Charges and taxes	851,782	794,996
Surplus	$ 313,307	$ 314,701

CUMBERLAND TELEPHONE AND TELEGRAPH COMPANY.

The Cumberland Telephone and Telegraph Company has issued its full pamphlet report for the year ended December 31, 1908. The income account compares as follows:

	1908.	1907.
Gross	$6,141,817	$5,917,273
Expenses	3,662,972	3,642,634
Net	$2,478,845	$2,274,639
Charges and taxes	485,415	521,950
Surplus	*$1,993,430	$1,752,689
Dividends	1,476,011	1,327,681
Surplus	$ 517,419	$ 425,008
Previous surplus	2,768,783	2,343,775
Total surplus	$3,286,202	$2,768,783

*Equal to 10.12 per cent earned on the $19,680,150 capital stock.

COLORADO TELEPHONE.

The Colorado Telephone Company reports for the year ended December 31, 1908. The statement of earnings compares as follows:

	1908.	1907.
Gross	$2,709,701	$2,514,366
Expenses	1,866,682	1,756,767
Net	$ 843,019	$ 757,599

The total miles of exchange lines as of December 31, 1907, were 150,852. The

same figures at the end of the year, December 31, 1908, were 159,598 miles, an increase of 8,746 miles. Thirty-six per cent of the total amount of wire is underground.

INTERBOROUGH RAPID TRANSIT.

Interborough Rapid Transit's report for the quarter and six months ended December 31, 1908, as filed with the Public Service Commission, compares as follows:

Three months ended December 31:

	1908.	1907.
Gross	$6,786,899	$6,301,496
Expenses	2,691,804	2,602,094
Net	$4,095,094	$3,699,401
Other income	341,988	306,940
Gross income	$4,437,083	$4,006,341
Deductions from income as follows:		
Interest on funded debt	$ 499,208	$ 275,000
Taxes on property	55,901	38,440
Taxes on earnings and stock	49,890	51,707
Taxes on special franchises	437,516	367,567
*Rentals	2,007,253	1,993,035
Discount and expenses	3,032	.....
Total deductions	$3,052,802	$2,725,750
Surplus	$1,384,280	$1,280,591

Operating cost, 39.66 per cent of earnings (excluding all taxes).

Six months ended December 31:

	1908.	1907.
Gross	$12,115,786	$11,456,623
Expenses	5,367,514	5,220,661
Net	$6,748,272	$6,235,962
Other income	679,163	596,520
Gross income	$7,427,435	$6,832,482
Deductions from income:		
Interest on funded debt	$ 999,208	$ 550,000
Tax on property and earn.	193,418	184,655
Special franchise taxes	747,516	627,567
Rentals	4,005,682	3,982,577
Discount and expenses	6,140	.....
Total deductions	$5,951,966	$5,344,800
Surplus	$1,475,469	$1,487,682

Directors of the Interborough Rapid Transit Company have declared the regular quarterly dividend of 2¼ per cent, payable April 1 to stock of record March 19. Books close March 19 and reopen April 1.

DALLAS ELECTRIC CORPORATION.

The earnings for the month of January and twelve months ended January 31, 1909, of this company compare as follows:

	1909.	1908.
January gross	$ 117,107	$ 89,616
January net	36,453	27,049
Surplus over charges	7,614	*2,581
Twelve months gross	1,197,459	1,127,965
Twelve months net	398,716	371,675
Surplus over charges	51,582	45,029

*Deficit.

GALVESTON-HOUSTON ELECTRIC.

The earnings for the month of January and twelve months ended January 31, 1909, of this company compare as follows:

	1909.	1908.
January gross	$ 91,435	$ 80,615
January net	32,436	29,528
Surplus over charges	10,403	9,036
Twelve months gross	1,099,266	1,055,866
Twelve months net	463,382	434,445
Surplus over charges	216,564	206,670

MINNEAPOLIS GENERAL ELECTRIC.

The earnings for the month of January and twelve months ended January 31, 1909, of this company compare as follows:

	1909.	1908.
January gross	$ 105,640	$ 93,936
January net	64,517	55,690
Surplus over charges	34,295	25,043
Twelve months gross	1,020,119	930,175
Twelve months net	584,914	501,849
Surplus over charges	202,737	186,599

NORTHERN TEXAS ELECTRIC.

The earnings for the month of January and twelve months ended January 31, 1909, of this company compare as follows:

	1909.	1908.
January gross	$ 88,937	$ 74,201
January net	34,394	30,846
Surplus over charges	17,210	16,773
Twelve months gross	1,095,313	1,060,202
Twelve months net	454,072	465,871
Surplus over charges	261,421	306,933

SEATTLE ELECTRIC.

The earnings for the month of January and twelve months ended January 31, 1909, of this company compare as follows:

	1909.	1908.
January gross	$ 402,810	$ 364,202
January net	152,517	124,308
Surplus over charges	54,279	42,199
Twelve months gross	4,559,096	4,191,672
Twelve months net	1,878,445	1,716,868
Surplus over charges	771,670	777,815

EASTON CONSOLIDATED ELECTRIC.

The annual report of the Easton Consolidated Electric Company for the year ended December 31, 1908, compares as follows:

	1908.	1907.
Gross (East Tr.)	$330,231	$350,168
Operating expenses	224,937	230,898
Net (East Tr.)	$105,293	$119,270
Charges and taxes	61,580	41,593
Surplus (East Tr.)	$ 43,713	$ 77,727
Add inc. Edison, Ill	26,550	26,270
Gross net, E. C. E	$ 70,263	$103,997
Operating expenses	12,301	8,230
Net, East. Cons. E	$ 57,962	$ 95,761
Charges	61,850	59,525
Deficit, E. C. E	$ 3,888	*$ 36,242
Dividend paid	.....	37,500
Deficit for year	$ 3,888	$ 1,258

*Surplus.

CATARACT POWER AND CONDUIT COMPANY.

The Cataract Power and Conduit Company reports for the fiscal year ended December 31, 1908, compared with the previous year, as follows:

	1908.	Changes.
Earnings	$1,058,531	*$ 83,277
Expenses	743,000	*103,086
Net earnings	$ 315,531	†$ 19,808
Other income	2,941	†3,339
Net income	$ 318,473	†$ 23,147
Fixed charges, etc	108,574	*8,490
Balance	$ 209,899	†$ 31,637
Bond redemption fund	38,100	*1,200
Capital amortization fund	46,000	†1,150
Total appropriations	$ 84,100	*$ 50
Surplus	$ 125,799	†$ 31,687
Previous surplus	250,027	*26,350
Total surplus	$ 375,326	†$ 5,337

*Increase. †Decrease.

AURORA, ELGIN & CHICAGO.

Aurora, Elgin & Chicago's report for January and seven months compares as follows:

	1909.	1908.
Gross	$ 99,637	$ 93,985
Expenses	61,937	58,903
Net	$ 37,699	$ 35,081
Deductions	28,189	28,111
Surplus	$ 9,509	$ 6,970
Seven months gross	880,682	877,207
Expenses	470,689	472,653
Seven months net	$409,993	$404,553
Deductions	194,667	194,694
Seven months surplus	$215,325	$209,859

Dr. Graham Bell's Tetrahedral Kite Experiments.

At Baddeck, Nova Scotia, the members of the Aerial Experiment Association have been trying out their new flying machine at the home of Dr. Alexander Graham Bell. The tetrahedral-kite principle has been a hobby of Dr. Bell's for many years, and the real reason for organizing the association was to develop the cellular kite as a practical flying machine.

A new fifty-horsepower, eight-cylinder motor was built at Hammondsport, N. Y., by Glenn H. Curtiss for the Silver Dart, and it is also being used in Dr. Bell's new tetrahedral kite, which he calls the Cygnet II. This is the first time that an effort has been made to raise one of these huge kites in the air by motor power. Last year the late Lieutenant Selfridge made a successful flight of more than half a mile in a tetrahedral kite, but it had no motor, the kite first being towed by a boat on the Bras d'Or lakes, and thus rising in the air like a glider.

The tetrahedral kite is composed of hundreds of triangular cells, the one now being tried out at Baddeck containing 3,690 of these cells. It weighs 950 pounds with the operator, including the motor, which, with all of its component parts, weighs about 200 pounds. The kite is about fifty feet long.

The association, which has been engaged in experimental work with aeroplanes and tetrahedral kites for more than a year, will be formally disbanded at Baddeck, N. S., on March 31.

The association has spent $35,000 in its experiments. Dr. Bell's big tetrahedral kite, equipped with a motor, which is known as the association aerodrome No. 5, and the Silver Dart aeroplane, are now at Baddeck, and several more trials will be made with them over the ice of the Bras d'Or lakes this month. Plans have been made for two new motors, one of twenty-five and the other of fifteen horsepower, which will be fitted to the new aeroplanes that are to be finished early in May.

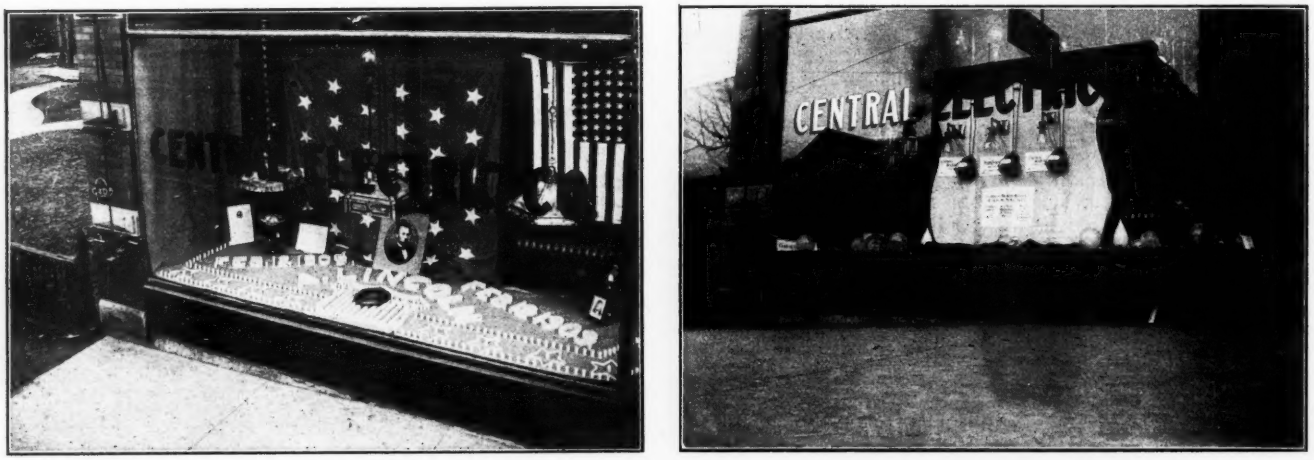
Novel Electrical Show Windows.

The accompanying illustration shows the window of the Central Electric Company of Peoria, Ill., which was trimmed in an appropriate manner for the Lincoln anniversary. The whole of the lettering was done with common porcelain knobs and the border was made of the same with the use of some three-inch tubes, as also the shield in the centre. All was made upon a background of blue, while upon the shield was a wax silhouette of the martyred president. The arrangement exhibited patriotism and good taste, and pedestrians by the score stopped to study it. The display showed what can be made with as unpromising materials as the common porcelain knobs and tubes used in wiring. The window was designed and arranged by L. B. Van Nuys of the company.

Important Developments in Mexico.

Important electrical developments have been reported from different parts of Mexico during the last few days. The most important of these is the project of installing a hydroelectric plant on the Conchos River in the state of Chihuahua. A syndicate of Canadians who were formerly interested in the Mexican Light and Power Company, have organized a company called the Mexican Northern Electric Company to carry out their plans for establishing the new plant in Chihuahua. G. F. Greenwood of Montreal, Canada, is president of this company. He and other stockholders are now in Mexico arranging for commencing construction work on the big enterprise. More than $5,000,000 will be expended in the installation of the initial hydroelectric plant which will have a capacity of 15,000 horsepower. The plant will be constructed so that it can be enlarged to meet future demands made upon it for power. It is planned to run transmission lines from the plant to the cities of Parral, Jiminez, Chihuahua and other smaller towns, and to many of the larger mining camps in that part of the country. It is stated that the Mexican Northern Electric Company has a working capital of $15,000,000 gold. E. B. Greenshields of Montreal is vice-president and Frank Thompson, of the same city, is secretary of the company.

Another large transaction in the electrical field of Mexico, which is now pending with every prospect that it will soon be consummated, is the purchase by the Guanajuato Power and Electric Company of the electric-light and power plants and the electric street-railway system of the city of Guadalajara. Those several interests are owned by the Compania de Tranvias, Luz y Fuerza, and are controlled by Fernando Pimentel, a multimillionaire of Mexico City. The Guanajuato Power and Electric Company, the stock of which is owned principally by Colorado Springs, Colo., men, has made an offer of $4,250,000 gold for the property of the Campania de Tranvias, Luz y Fuerza. One of these is that Mr. Pimentel and associates must remove from the field all competing interests. In order to do this the Pimentel interests have entered into a combination with Manuel Cuesta, of Guadalajara, who owns a valuable concession from the Mexican government for the installation of a hydroelectric plant on the Santiago River and the establishment of electric street-railway system and lighting facilities for Guadalajara, whereby a company with a capital stock of $10,000,000 (Mexican) shall be formed to take over and put into operation that part of the Cuesta concession which provides for the installation of a hydroelectric plant and the building of transmission lines to Lake Chapala where the power will be used for irrigating works. The Guadalajara field will not be invaded by the Cuesta company under the terms of this agreement. The Guanajuato Power and Electric Company recently enlarged the capacity of its hydroelectric plant at El Duro, state of Michoacan. The company is now furnishing power from its El Duro plant for the Guanajuato mining district and city, and several other towns of that region, including Irapuato and La Barca. Some of its transmission lines are already more than 100 miles long, and if it enters the Guadalajara field from its El Duro plant this transmission line will be 200 miles or more in length. D.



NOVEL ELECTRICAL SHOW WINDOWS OF THE CENTRAL ELECTRIC COMPANY, PEORIA, ILL.

Another window that attracted much attention is shown in another illustration. It was arranged to show the saving in consumption of current by the use of tungsten lamps. On the shield were shown three meters all connected to the respective lamps, which were a thirty-two-candlepower lamp, a forty-watt tungsten and a common sixteen-candlepower lamp. The wires from the meters were taken direct to each lamp in plain sight, and with the use of the glass-case meters made a striking demonstration of the saving of current by the use of the new lamps. The signs also gave a short description of the lamps and helped draw attention to the saving of current. The use of the glass-cased meters allowed the revolutions of the discs in the meters to be seen from the sidewalk; also the longer the lights were used the greater was the difference registered. V.

The St. John River Development of the Grand Falls Power Company.

The contract for the construction work involved in the hydroelectric development of the Grand Falls Power Company on the St. John River at Grand Falls, N. B., has been placed in the hands of the Frank B. Gilbreth organization of New York. John B. McRae of Ottawa, Canada, is the chief engineer and Ralph Mershon of New York is the electrical engineer.

This plant will generate 100,000 horsepower, which will be furnished to the various cities throughout New Brunswick and Maine.

The work involves, among other features, the construction of a number of shafts in rock excavation 130 feet deep, a power chamber thirty feet by 260 feet and 130 feet deep, and a tail-race tunnel twenty-eight feet in diameter and 2,400 feet long, a power house 350 feet long and 260 feet wide. The intake shafts will be nine in number and twelve feet in diameter, 130 feet deep.

The plant will be equipped with the most approved hydraulic and electrical machinery for high-potential and long-distance transmission. Actual construction will be begun immediately.

The falls and waterpower on the St. John River at this point is the largest in Eastern Canada and its development will result in the establishment of a large number of manufacturing enterprises. The total head developed will be 135 feet. Numerous auxiliary works, substations and long-distance transmission lines will be erected.

The St. John River at Grand Falls (which is the largest river in New Brunswick) describes a horseshoe curve at this point and has a fall of 135 feet.

Grand Falls is situated on the Canadian Pacific Railroad about 200 miles north of St. John, N. B., and about two miles east of the state of Maine.

The expenditure involved will amount to over $5,000,000.

Missouri Electric Association.

The executive and advisory committees of the Missouri Electric Light, Gas and Street Railway Association have chosen Springfield as the place of meeting for the annual convention to be held April 15, 16 and 17. The membership and influence of the association are constantly growing. W. B. Hays is president, R. J. Irvine, first vice-president, and C. L. Clary, secretary and treasurer.

Industrial Exposition at Cleveland, Ohio

Cleveland's Industrial Exposition, which will be held June 7 to 19, will be unusual among home-product expositions in the diversity of manufactures shown. It is estimated that 125,000 different articles come out of the city's 3,500 shops. Cleveland is in the lead of American cities producing steel ships, heavy machinery, hardware, twist drills and small tools, wire and wire nails, bolts and nuts, vapor stoves, electric carbons, malleable castings, telescopes, gasoline, steam and electric automobiles.

The exhibits range from the latest types of street cars and ponderous machinery, to the intricate products of expert workmanship, and to accommodate them the exposition committee has chosen Central Armory, the largest available hall in the city, and will erect a temporary exposition building diagonally across the street. The area of the two halls will be 14,655 square feet. The short approach to the exposition buildings from the main thoroughfares of the city will be appropriately decorated, and illuminated at night.

Telephone Lines Merged.

The directors of the United States Telephone Company, Cleveland, Ohio, on March 6 closed a contract with representatives of the Independent Long Distance Telephone and Telegraph Syndicate, of New York and St. Louis, for operating in connection with the United States company's lines in Ohio, Indiana, Michigan, New York and Pennsylvania.

The contract contemplates the organization of a corporation with a capital of $2,500,000 as a preliminary company to co-operate with the United States company.

One million of this amount is to be paid in within six months. The formation of the new company will mean an extension of the independent lines.

An Impostor Working the Electrical Field.

Notice has been given by several electrical companies that a man representing himself as George W. Reed and also as Mr. Phillips, has attempted to borrow money from electrical companies by placing with them a fictitious order and negotiating for a large purchase. He is described as a good-looking man of about fifty years of age, about five feet eight inches in height, with gray hair and mustache. He is apparently moderately versed in electrical matters.

Street Cars that Run Through Water.

The Ohio River has a decided flood period each spring, as it is laden with the melted snows from the Appalachian Mountains. The river rises to such an extent that its adjacent lowlands and wharves are flooded for some time. In Cincinnati, Ohio, the lower part of the city, generally called the "bottoms," is annually subjected to a prolonged flood in which the cellars are invariably filled with water and the streets become impassable.

When the water gets so high that it would get into the street-car motors, the traction company fits up special cars with the motors and wiring elevated above the danger line. These cars then make the run through the flooded district and

CAR RUNNING THROUGH SUBMERGED STREETS IN CINCINNATI, OHIO.

transfer their passengers to regular cars at the borders of the affected area.

The accompanying illustration shows a group of these cars in Cincinnati and a characteristic scene in its "bottoms." The cars are well patronized by people who take the trip for its novelty.

"Wireless" Dispatching from Fast Train.

A special train equipped with "wireless" apparatus exchanged messages while running at full speed between Cleveland and Chicago last week. On the train were the members of Frederick Thompson's theatrical company, which has been presenting "Via Wireless."

Wires were carried to an aerial strung on the roof of the car. The first successful message was sent to Cleveland just before that city was reached. From that time until within thirty miles of Chicago the operator was in unbroken communication with other operators in the cities along the line.

REVIEWS OF CURRENT ENGINEERING AND SCIENTIFIC LITERATURE

THE USE OF STEEL BANDS AS TRANSMISSION BELTS.

Steel bands have recently begun to be used in place of leather, rubber and other belts or rope for the purpose of power transmission. On account of their thickness, ordinary belts can be used only with pulleys of large diameter, and they must be frequently tightened. These inconveniences are absent when steel bands are used. They need not be retightened, do not slip and they also wear less quickly than belts of other material. On account of their great strength the steel bands can be narrower than ordinary belts, and the pulleys can be narrower and lighter. They can be made absolutely rectilinear, and they operate regularly and noiselessly. They are now used in many shops and are preferable where there are great variations of temperature and where the atmosphere is damp. The motor and the machine driven may be placed close together when steel bands are used. Professor Kammerer, of Charlottenburg, has made very exact tests with them and found that a band ten millimetres wide and 0.5 millimetre thick can be used for transmitting ten horsepower. The slip was at most 0.15 per cent and the loss of power insignificant. The steel bands are also extensively employed with dynamos and electric motors, for they require no attention and they work uniformly, without shocks and jerks. Their original cost and expense or maintenance is lower than that of ordinary belting.—*Translated and abstracted from L'Industrie Electrique (Paris), February 10, 1909.*

OZONE VENTILATOR.

The disinfectant properties of ozone are well known, and a large number of apparatus, nearly all utilizing the silent discharge, and therefore requiring a transformation of current, have been invented. The principle of the present apparatus is based on the possibility of producing ozone by making the oxygen of the air act on certain incandescent bodies. The material used is a Nernst rod, and it gives excellent results. The apparatus comprises a small fan, which draws air through a tube, the centre of which contains the incandescent body. The Nernst rod is first heated by a coil, and when it has reached the required temperature this coil is automatically disconnected by an electromagnet and the fan is started automatically at the same time. The entire apparatus is small and mounted on one base. The quantity of ozone formed is relatively large. A slight odor of ozone is diffused in a few minutes through a room of 100 to 150 cubic metres by a single apparatus.—*Abstracted and translated from L'Industrie Electrique (Paris), February 10.*

SEARCHLIGHTS IN NAVAL WARFARE.

There is probably no more serviceable field for the searchlight than its use in the navy. Its value in exposing prowling torpedo boats on a dark night is its most useful application in this service. The area commanded by a searchlight would seem to be of sufficient extent to keep such boats out of torpedo range, and if they come within the light-swept area they should be directly dispatched by gun fire. However, it has been found that the value of the searchlight in this respect is considerably diminished by a number of peculiarities. The searchlight beam serves to embarrass the gunner almost as much as it helps him. The preponderance of blue and violet rays in the light causes the appearance of a white fog, due to reflection of particles of dust and moisture in the atmosphere, since these rays, being of shorter wave-length, are most easily absorbed. Therefore, those rays that have traveled as far as the objective point and have been reflected back are very much weaker than those that have traveled out only as far as the dust particles and returned a shorter distance. The effect is to reduce the contrast between the large volume of reflected light arriving from the object and the smaller volume of brighter light reflected from the atmosphere. If a red beam can be employed, this contrast would be much more marked. There would be much less absorption, and the greater volume of reflected light from the boat or other object would make it a more conspicuous target. Another error is due to the high reflective power of the smaller wave-lengths, which makes the objects appear to be in a false position. Still another defect and a very serious one is that the bright beam thrown by a searchlight exposes its source and makes it visible in all directions. To overcome some of these defects, it has been proposed to polarize the beam of light. This would make the beam almost imperceptible, and yet make it equally effective in illuminating the objective point. Since polarization introduces complications, however, it has been proposed to increase the efficiency of the searchlight as a defensive weapon by suppressing the violet end of the spectrum. This could be accomplished somewhat at least by using instead of a silvered mirror a reflecting surface that would reflect only the longer wave-lengths. Still another solution seems to be to make the nature of the light emitted by the arc itself of such a character as to avoid the short wave-lengths; for example, by using orange light, such as is now quite common for arc lamps.—*Abstracted from the Electrical Review (London), February 19, 1909.*

STEAM-TURBINE EFFICIENCY.

This article opens with a refutation of the old fallacy that the efficiency of a steam turbine decreases as the number of stages is increased. From the standpoint of hydraulics, the statement that a reduction of stages tends to an increase of efficiency is unsound, and in the case of a turbine working with an elastic fluid it is even more fallacious. In the steam turbine not only does the efficiency gain by the fact that with a large number of stages the final loss by "carry-over" is reduced, but there is a further benefit from the fact that in the multi-stage turbine the efficiency ratio is always greater than the hydraulic efficiency, because part of the energy wasted in fluid friction at the higher stages is available for doing work in the lower. This discrepancy between the hydraulic efficiency and the efficiency ratio of a multi-stage turbine becomes greater the less the hydraulic efficiency. Neglecting "carry-over" losses, the efficiency of a turbine depends upon the relative and not on the absolute velocities of the moving fluid. It is as im-

portant that the relative velocities shall not be such as to involve high losses by shock and fluid friction in the fixed blades, as it is in the case of the moving ones. Aside from leakage losses and commercial considerations, the possible efficiency of the reaction type of steam turbine should be considerably greater than that of the impulse type. In the former the losses per stage are due to the friction and shock at one row of blades only, while in the latter type there are included in each stage the losses due to friction and shock of two rows at least. In commercial practice, however, there is no great difference between the best recorded efficiency ratios of the two classes. This is due to the fact that the reaction type suffers more from leakage losses than the impulse type, and also because it is commonly run at full load at a much lower fraction of its synchronous speed than is the impulse type, in order to reduce its first cost.—*Abstracted from Engineering (London), February 19, 1909.*

BENZINE-ELECTRIC MOTOR CARS FOR RAILWAYS.

A benzine-electric car recently furnished by the French Westinghouse company for a small railway in Eastern Prussia is here described. The equipment of the car consists of a benzine motor with flywheel, connected to a dynamo by means of an elastic coupling, the tubing for the benzine motor, the conductors and apparatus of the direct-current dynamo, two direct-current railway motors and the controlling devices. The benzine motor is a Westinghouse machine of the four-cycle, four-cylinder type, capable of developing fifty horsepower at 925 revolutions per minute. Each cylinder has a bore of 135 millimetres and a stroke of 155 millimetres. The carburetter is attached to the motor. The cylinders and valve seats have double walls to permit the circulation of the cooling water, which is driven through it and the cooler on the roof of the car by a small pump. Lubrication of the machine is also effected by a small pump. The dynamo has four poles and generates thirty-two kilowatts under a tension of 500 volts at 925 revolutions per minute. Each one of the motors has a capacity of twenty-five horsepower at 380 revolutions per minute. Their power is transmitted to the driving axle by means of gearing. The speed of the car is regulated from the benzine motor, and for this purpose the flow of gaseous mixture into the motor can be controlled by suitable devices from the motorman's cabin at each end of the car.—*Abstracted and translated from Elektrotechnische Zeitschrift (Berlin), February 11.*

April Meeting of the American Institute of Electrical Engineers.

The meeting of the American Institute of Electrical Engineers, to be held in New York city on April 9, will be devoted to two papers relating to high-tension transmission. These are "High-Voltage Transformers and Protective and Controlling Apparatus for Outdoor Installation," by K. C. Randall, and "Condenser Type of Insulation for High-tension Terminals," by A. B. Reynders. The first paper deals with the design of transformers, oil switches and lightning arresters for installation outdoors, so as to save the cost of a substation building and to do away with the expense of high-voltage wall outlets. The second paper relates to a new design of high-voltage terminals and bushings, which results in a much smaller and more reliable bushing than those which have been used heretofore and which is readily adapted to the construction of bushings for outdoor apparatus.

The Southern Electrical and Industrial Exposition.

The Southern Electrical and Industrial Exposition, which will be held in the First Regiment Armory, Louisville, Ky., April 12-24, under the auspices of the Louisville Commercial Club, promises to be one of the most important electrical events ever held south of the Ohio River. Louisville and the South generally have perhaps been notably deficient in point of electrical development, and in this territory there appears a good opportunity for the wide-awake trade missionary to get in some good work. The show, declares the management, will be equal if not superior to the great show held recently in Chicago.

The Commercial Club, which is sponsor for the exposition, has a well-known faculty for carrying out this kind of work, and points with pride to its success in the Greater Louisville Exposition, which was held in 1907, and which drew 200,000 persons to the city. The electrical event is expected to be productive of even better results, since an advertising campaign, such as has never before been attempted, is now being waged throughout the South. In fact, the section south of the Ohio River and east of the Mississippi River has been deluged with literature and souvenirs advertising the Louisville Electrical Exposition, and every salesman traveling out of Louisville is making personal mention of the exposition to those he meets. The railroads are aiding in the success of the enterprise, having fixed the very low rate of one fare plus twenty-five cents for the round trip, from all points in the South.

Sufficient space has been disposed of to insure the success of the exposition, and among the exhibitors will be found some of the most important electrical manufacturers in the United States.

A Joint Meeting of the Four National Engineering Societies.

On Wednesday evening, March 24, the American Society of Civil Engineers, the American Institute of Mining Engineers, the American Society of Mechanical Engineers, and the American Institute of Electrical Engineers, will hold a joint meeting in the auditorium of the Engineering Societies Building, in New York city. The topic to be discussed is the conservation of natural resources. A representative from each society will present a paper in regard to some specific feature of this vital economic problem. The authors and titles are:

1. American Society of Civil Engineers—"The Conservation of Water," by John R. Freeman.

2. American Institute of Mining Engineers—"The Conservation of Natural Resources by Legislation," by Rossiter W. Raymond.

3. American Society of Mechanical Engineers—"The Waste of Our Natural Resources by Fire," by Charles Whiting Baker.

4. American Institute of Electrical Engineers—"Electricity and the Conservation of Energy," by Lewis B. Stillwell.

Owing to lack of time, there will be no discussion on these papers. No resolutions will be adopted, nor any action taken which would committ any or all of the societies to the indorsement of views presented either in the paper or in the discussion communicated afterward. About ten days before the meeting each society will send a notice to its own members; this notice will state more fully the object of the meeting, and should be considered as an invitation to any member to submit a written discussion on the papers.

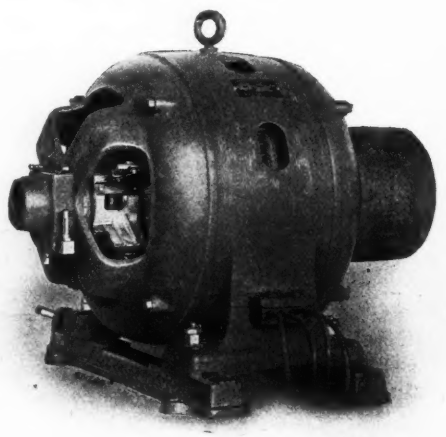
The chairman of the A. I. E. E. committee on conservation of natural resources is Henry G. Stott, 600 West Fifty-ninth Street, New York.

INDUSTRIAL SECTION

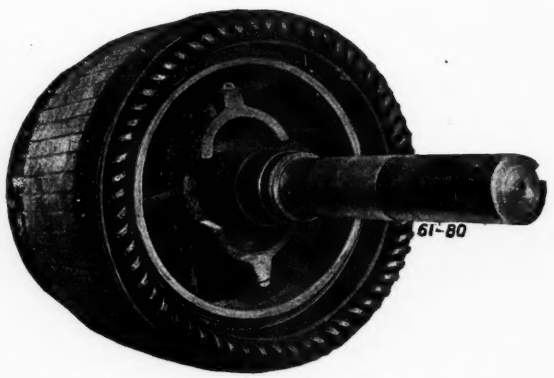
ILLUSTRATED DESCRIPTIONS OF NEW AND STANDARD ELECTRICAL AND MECHANICAL APPARATUS

Wagner Single-Phase Motors.

The Wagner single-phase motor is an induction motor having a commutator mounted on the rotor shaft and connected to the rotor winding. Starting with the machine at rest, the brushes, which are in pairs and cross-connected through a low-resistance conductor, bear upon the commutator, temporarily short-circuiting the rotor winding and developing a very powerful starting torque on the "repulsion" principle. On attaining full-load speed, by the operation of an automatic centrifugal governor, the individual segments of the commutator are all positively connected together, thereby transforming the rotor winding to the squirrel-cage form; the motor then continues as an induction-type machine. The governor at the same time removes the brushes from contact with the commutator to save wear.



WAGNER SINGLE-PHASE MOTOR.



ROTOR OF WAGNER SINGLE-PHASE MOTOR.

No harm can be done the Wagner single-phase motor by suddenly interrupting or, without the intermediary of resistance, suddenly re-establishing the circuit at any stage of the cycle of its operation from rest to full speed, irrespective of load conditions. If the power service should fail for any reason, the motor returns to the starting condition, and picks up its load when the power comes on again, without the assistance or attention of the operator.

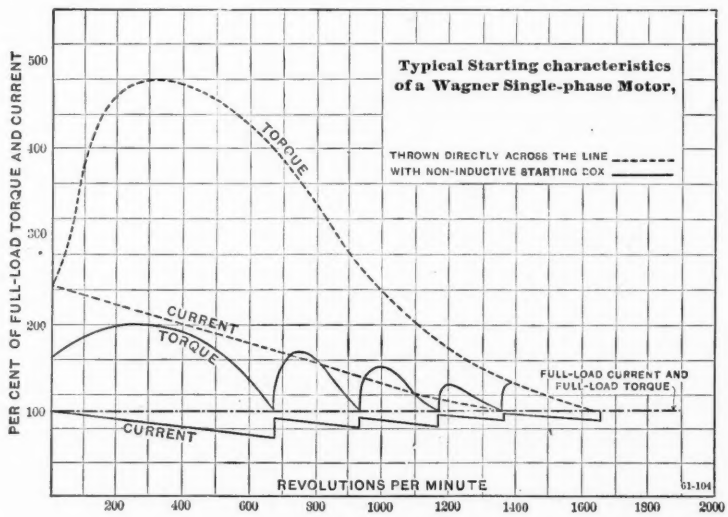
The greatest difficulty in the use of alternating-current motors upon lighting circuits is in the disturbance produced at the moment of starting. Polyphase motors of the squirrel-cage type take from three to eight times normal current at the instant of starting, when full normal torque is required, and, if this current is at low-factor, considerable disturbance will result unless the feeder and transformers are both of ample capacity.

For a given torque, Wagner single-phase motors disturb the one phase from which the entire power is taken, less than the usual polyphase motor disturbs every phase. The actual currents per line wire for full-load torque in motors wound for 220 volts is shown in the following table:

Type of Motor.	Size of Motor in H. P. 5	7.5	10	15
	Amperes. Per Line Wire.			
3-phase squirrel-cage with auto-starter..	54	80	105	140
2-phase squirrel-cage with auto-starter..	50	75	98	132
Wagner single-phase without starting box	45	68	90	125
Wagner single-phase with starting box..	33	50	65	90

It is interesting to note in this table that the starting currents required for single-phase motors, without starter, are favorable as compared with polyphase motors, and that when a starter is employed the advantage in the matter of line disturbance is greatly in favor of the Wagner single-phase type.

In the diagram is shown the torque and current of a Wagner single-phase motor with and without starting box. It will be seen that the maximum current of two-and-one-half times normal is obtained only at the instant of starting, and that it falls off rapidly to normal at full-load speed (or less if the motors are under-loaded). The time required under usual conditions for the motor to attain full speed is from eight to twelve seconds. Motors may therefore be fused for full protection without danger of blowing at the instant of starting, partic-



STARTING CHARACTERISTICS OF WAGNER SINGLE-PHASE MOTOR.

ularly so if starting boxes are employed. The maximum torque is exerted at about fifteen per cent of normal speed, descending in an easy ratio to full normal torque at normal speed. The full line, indicating torque obtained when a starting box is employed, may naturally be varied according to the requirements by advancing the starting arm more or less rapidly.

Wagner single-phase motors are furnished for all frequencies from twenty-five to 140 cycles and in various sizes from one-quarter horsepower to forty-horsepower capacity.

The Wagner variable-speed motor differs from the constant-speed motor principally in that it has a commutator which remains in service all the time. The speed variations are secured by means of an autotransformer controller. As the torque of alternating motors varies directly as the square of the applied pressure, wide speed variation may be obtained by varying the voltage applied at the motor terminals.

The motors described above are manufactured by the Wagner Electric Manufacturing Company, of St. Louis, Mo.

"Union" Shallow Sectional Switch Boxes.

In order to accommodate the growing demand for shallow switches and receptacles that has lately induced the makers of this line of goods to bring out a shallow-type switch, the Chicago Fuse Wire and Manufacturing Company has designed two shallow boxes of the sectional-type construction, to be employed in thin partitions, outside walls, and where there is not ample room, or where it would entail additional work in cutting away the material, to install a deeper box.

The CCS or loom box, as shown single in Fig. 1, is two inches deep, outside dimensions, and will take all makes of shallow switches and receptacles. The switch lugs are drilled on standard centres, and, being formed outward, enable the body of the box to be made short enough so that the attachment ears are effectually covered by the flush plate when used in old work. The CCS box is provided with two knock-outs in each end, but has none in the back. It may be equipped with any of the three types of ears shown in Figs. 2, 3 and 4. It may be built up into gangs from the single box as well as from the two-gang, and the hook-eye construction used throughout allows the spacers to be inserted without removing screws, which avoids the danger of their being lost in the operation.

Fig. 2 illustrates the regular type F ear, furnished on "Union" switch boxes, unless one of the other types is desired. This has the well-known sliding adjustment and reversible feature, so that it may be set to various depths when used in new work, according to the thickness of the plaster, and being supported by pivoted connection may be turned at any angle to enable striking the lath, which is particularly convenient in old-house wiring.

Fig. 3 shows the type C ear, which for certain places is desirable, especially when used in connection with a rotary flush switch in which the plate has no supporting screws. The ears being recessed into the plate, help hold it more rigidly in place.

Fig. 4 shows the type SF ear, which is used only in connection with new work, and is preferred where a strong anchorage of the switch box is desired. The attachment screws being further from the edge of the supporting strips, are less likely to split or pull out. This ear is also provided with an adjustment slot, so that the face of the box may be brought out three-quarters inch to seven-eighths inch from the plaster line. Being of stamped steel, there is no danger of breaking off the ear by falling or by being twisted at an angle, as frequently occurs in the case of cast-iron switch frames.

In Figs. 5 and 6 the No. 170 shallow conduit box is shown in single and two-gang styles, while Fig. 7 shows the spacer used to build the box up into any number of gangs. This wall case measures four inches long, two inches wide and seven-eighths inch deep, outside dimensions, and has switch lugs spaced to take all makes of standard shallow switches and receptacles. As shown in cut, this is a combination loom and conduit box, having entrance at each end for one-half-inch conduit or BX armored cable and two five-eighths-inch openings on either side for loom, these being located as far from the centre as possible so that the ends of the tubing will not interfere with the installation of the switch.

Fig. 1.

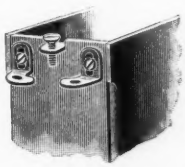


Fig 2.

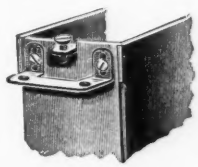


Fig. 3.

Fig. 4.

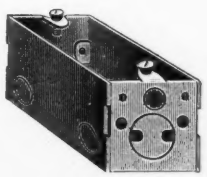


Fig. 6.

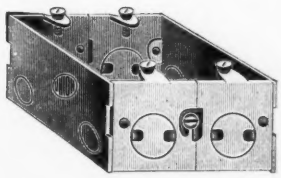


Fig. 5.

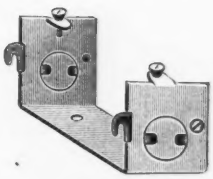


Fig. 7.

FEATURES OF "UNION" SHALLOW SECTIONAL SWITCH BOXES.

The box particularly lends itself to use in outside walls where a ferring strip is used on the brick, in which case the conduit can be run back of the lath, and it is not necessary to recess the box in the brick wall. This box is also equally suitable where thin partitions are constructed with inch uprights for holding of the lath. The combination of conduit and loom outlets in the same box makes it particularly adapted to use where changes have to be made from conduit to open work.

A flat steel cover can be furnished for this box, which makes it an excellent small junction or pull box, and when desired in new work it can be equipped with either of the ears noted and illustrated above.

The Worcester Mechanical and Electrical Exposition.

At Mechanics' Hall, Worcester, Mass., where preparations are being made for the Mechanical and Electrical Exposition to be held March 27 to April 3, a number of prominent business firms have taken space and will give practical demonstrations of the manufacture of their products. A thirty-foot electrical house, beautifully illuminated and fitted with all the modern electric devices, will be an additional attractive feature in one of the halls.

Neponset Splicing Compound.

The Massachusetts Chemical Company has been in the business of manufacturing electrical insulations for over seventeen years. During that time it has had a busy and growing plant, supplemented by a well-equipped laboratory. With these facilities it has been able to follow closely the growing needs of the electrical trade in its particular field, and the accumulated experience of the company has resulted in a group of insulating fabrics and compounds of recognized excellence. Among these, Neponset splicing compound is declared to be one of the most satisfactory products ever manufactured and marketed by this company.

The requisites of a first-class splicing compound are permanently high mechanical strength, adhesiveness and dielectric strength, and ease of manipulation. The material having these qualities, when applied to a wire joint, for example, makes a protecting covering that reliably maintains the insulation of the joint equal to that afforded by the original covering of the wire, under all conditions of service. It is claimed that these qualities are possessed in pre-eminent degree by Neponset splicing compound. In the process of manufacture, this compound is rolled to two standard thicknesses, of 0.035 and 0.048 inch, sheeted on glazed muslin and then cut into tape. It is put out in one-half-pound rolls three-fourths inch wide, unless otherwise specified. The glazed muslin, by preventing access of air to the compound, prevents surface curing of the latter, and the full adhesiveness is thus preserved. The strip of muslin also protects the turns of the tape from sticking together in the roll.

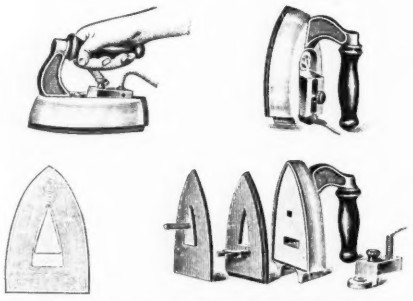
The permanence of the compound, a quality which is insisted upon in all of the Massachusetts Chemical Company products, is evidenced, it is stated, by the absence of any deterioration with age. Such deterioration always shows, in ordinary compounds of inferior quality, by a loss of mechanical strength. This splicing compound, on the contrary, will stand a tensile stress of 500 pounds per square inch of cross-sectional area, so that in winding it around a conductor or wire joint the manipulator may stretch it as strongly as may be necessary to make a tight, snug covering, without risk of breaking it from the pull.

The adhesiveness of this compound is inherent throughout the mass, and is not merely a surface stickiness. The adhesiveness is so great that moderate tension in winding the tape over a joint or conductor causes the successive overlapping layers to become an integral part of one another, making a thoroughly watertight, as well as waterproof, envelope. In such a protected covering, made with Neponset splicing compound, the overlapping turns virtually coalesce, as may be shown by cutting lengthwise through the mass. The cut surfaces show no line of demarkation between the layers of the tape, and the mass appears as a continuous, impervious envelope.

The dielectric strength of the compound is high. A single thickness of the 0.035-inch tape will successfully withstand a puncture test of 10,000 volts. This high value renders the compound especially valuable and safe to use in high-tension transformers, joints on transmission lines and in station wiring, and in all places where the circuits are liable to be subjected to high-potential strains due to lightning, surges on the line, and the like.

The Pelouze Universal Iron.

In the design of an electric iron to secure the maximum economy and efficiency, the arrangement of the heating elements should be such as to give the most intensive distribution of heat at the points and edges. As shown in the accompanying illustrations, the construction of the Pelouze Universal iron embodies this feature. The heating coil is wound in a flat plane, so that it operates directly upon the bottom of the iron, securing a rapid heating of the working surface with a minimum consumption of electric current. From an illustration indicating the heat distribution, it will be observed that, while the body is uniformly heated, the point or toe and the edges receive extra heat, so that delicate work can be performed without danger of scorching from the overheated centre. The distribution of mass in the iron is so disposed that the greatest weight is at the point. Since the body of the iron is filled with asbestos, the top does not become hot during use.



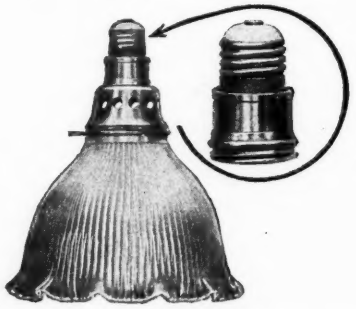
THE PELOUSE UNIVERSAL ELECTRIC IRON.

The extreme simplicity of construction is well shown in the dissembled view, in which the heater element and bottom plate have been removed. As a matter of mechanical construction, it may be noted that no stand is required for this iron. Tipping it back rests it on the handle and insulating pedestals designed for the purpose. The temperature control is effected by a switch under the operator's hand. The cantilever support of the handle enables it to be gripped quickly, making rapid work possible.

The Pelouze Universal electric iron is made in three sizes, weighing four pounds, six-and-one-half pounds and nine pounds, respectively. The Pelouze Electric Heater Company, 403-413 Ohio Street, Chicago, is the manufacturer.

The Benjamin Socket Extension.

A convenient means of attaching glassware where the construction of the outlet or receptacle does not otherwise permit it, is afforded by the Benjamin socket extension. This simple device increases the length of the socket only one-and-one-quarter inches. The shell is provided with a bead for the standard shade-holder and the extension is especially serviceable for flush sockets and ceiling receptacles. The socket extension is manufactured by the Benjamin Electric Manufacturing Company, Chicago, New York and San Francisco.



BENJAMIN SOCKET EXTENSION ATTACHED TO HOLDER.

BENJAMIN SOCKET EXTENSION.

A New Line of Duncan Integrating Meters for Direct and Alternating Current Circuits.

A new Duncan direct-current integrating wattmeter, house type, model E, is now being put on the market by the Duncan Electric Manufacturing Company, Lafayette, Ind.

The accompanying illustrations indicate that its design is up to date and in strict accordance with modern requirements.

The back portion, as well as the lower shelf or magnet support, are made from sheet brass formed up into shape under pressure, so that they present a degree of strength and rigidity that surpasses the castings used on the older forms, besides reducing the total weight of the meter.

Mounted upon the lower magnet support or shelf is a well-proportioned arch which is also pressed up from sheet brass, and to which are attached the series field coils, compensating coil, upper bearing, brushes and compensating switch, thereby enabling all of the principal elements to be combined on one support.

The new binding posts are so constructed and fastened into the back of the meter that they are both dustproof and fireproof.

The registering train has four circles of large dimension, so that they can be read with ease at a considerable distance. The gear wheels and pinions are cut by automatic machinery, which renders the possibility of their binding or sticking remote.

The multipoint-switch method of compensating for friction and vibration is maintained throughout the entire line of these instruments, and no change has been made in it by virtue of its giving such universal satisfaction. To secure any degree of compensation simply involves the movement of the compensating switch lever over one or more contacts, and when the proper amount has been obtained, it is impossible to bring about any change through rough handling.

The cover is dust, moisture and insect-proof, and is held in position in a novel manner by the use of wing-headed screws, which are so fastened upon the inside that it is impossible for them to drop out and become lost when the cover is turned upside down.

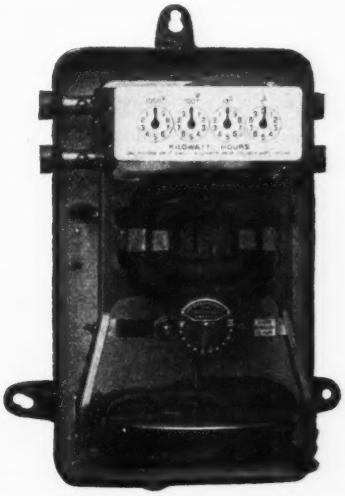
The method of sealing is also new, and is a guarantee against tampering by unauthorized individuals.

The high accuracy of this instrument is due to its high turning moment, the smallest size having a torque of not less than 200 millimetre-grams, or nearly twenty-five per cent greater than usual. The larger meters have, of course, a greater torque, and in some of these sizes it is as high as 600 millimetre-grams.

The quality of the steel employed to make the permanent magnets is the same

DUNCAN DIRECT-CURRENT INTEGRATING WATTMETER.

as has been used by this company for years, and is known as the "Remy" brand. It is a special steel of exceptionally high retentivity and permanence. In order to make these magnets as permanent as possible, they are put through a



DUNCAN DIRECT-CURRENT INTEGRATING WATTMETER, INTERIOR VIEW.

process of artificial aging which enables them to maintain a uniform strength for an indefinite period, so that the accuracy of the meter is not changed unless through some other cause, such as the accidental breaking of a sapphire jewel or the like.

For the 110-volt sizes, the resistance unit is of the cartridge type. It is four inches long and one inch in diameter, and is slipped into the meter in the same manner as a cartridge fuse into a fuse block, which renders its removal or insertion a matter of a few seconds. This resistance unit is embedded within a fireproof composition.

The other patented features which have made the Duncan product so popular are still retained, such as the visual bearing, which permits the insertion and removal of the detachable spindle point, also examining and oiling of the bearing; and the threadless jewel post.

The old form of armature is also maintained. It is easy to repair; is mounted upon a light framework, and is wound with 8,000 turns of No. 40 B. & S. gauge electrolytic copper wire, insulated with Italian Tram silk.

The brushes are of the direct-tension type, which has demonstrated for itself that it is the safe and practical way to avoid sparking, particularly when the meter is installed in places where there is vibration.

To facilitate the work of testing, each meter is now marked with the exact number of watts that is required to make one revolution per minute, so that anyone undertaking to test the meter will know the watts required without having to figure it out from a constant.

The Duncan company has also put upon the market a full line of astatic switchboard meters. The series field coils are so arranged that they oppose each other, and within them is placed a four-pole armature with the brushes set upon the commutator at an angle of ninety degrees.

It is stated that tests which have been going on for some time have proven that this type overcomes, to a greater degree, the influence of external fields, than any other combination that has yet been tried. By bringing bus-bars as close to the meter as its mechanism will permit, the errors introduced thereby are scarcely perceptible and do not exceed two per cent.

This new idea of the Duncan company, as applied to its meters, is also being carried out in the larger sizes of house-type meters, inasmuch as there has been a complaint for years, from central stations, regarding the detrimental influence which nearby conductors have on their accuracy.

Storage Batteries in Iron and Steel Mills.

The Electric Storage Battery Company, Philadelphia, has just issued Bulletin 112, covering the use of storage batteries in iron and steel mills.

The rapidly increasing use of electricity in such mills, requiring current of large volume and generators and motors of great capacity, has resulted in a number of problems of installation, distribution and regulation, the solution of which is of vital importance to the ease and economy of plant operation. The electric storage battery is now being used as an aid in the solution of these problems, and it is the object of this new bulletin to describe briefly the function of the storage battery as an adjunct to the electrical system.

Many examples of installations are given, such as the Illinois Steel Company, Lukens Iron and Steel Works, and the Edgar Thompson Works, the Duquesne Works and the Youngstown works of the Carnegie Steel Company. The greatest application of electricity to rolling mills is, of course, the new installation at Gary, Ind., which is described.

It will be noted that the storage battery has the following functions in steel and iron mills: First, regulation at the end of the line. Second, direct-current power-house regulation. Third, alternating-current power-house regulation. Fourth, combination direct-current and alternating-current power-house regulation. In all of these cases the battery can be used as a reserve in case of a breakdown while getting other apparatus into service.

The total capacity of batteries of Chloride accumulators installed by the Electric Storage Battery Company in the various steel and iron mills is upward of 50,000 amperes at the regular rate of discharge.

Predict Successful Year for Western Electric Company.

"If the ratio of increase of January's business over that of December," said an officer of the Western Electric Company, "is maintained during each successive month of the current fiscal year, the gross sales for the year will total about $50,000,000."

In certain lines the business of the Western Electric has been exceptional during January. The month shows a large increase over those of January, 1908, the improvement being especially marked in electric-light machinery. Among large-sized orders was one for a low-pressure turbine of 4,000-horsepower capacity for the new passenger station of the Chicago and Northwestern Railroad Company which is to be erected in Chicago. Several of the larger railroads have given orders for telephones and general electrical supplies, and the growth of train despatching by telephone instead of by telegraph is increasing notably. Telephone business with the farmers throughout the country continues to show a steady growth.

Sales to operating telephone companies exceed those of January a year ago. Sales of machinery and electrical supplies to central stations, mills and factories also increased, so that January not only was greater than January, 1908, in these lines, but was the largest first month of the calendar year for any year in the history of the company.

The Western Electric is at present employing approximately 1,600 persons, which is a much larger force than employed twelve months ago, and the forces at the shops are being increased daily. Several of the shops are operating at nearly full capacity, and the Hawthorne shops which manufacture the heavier machinery are operating overtime.

A New Small-Bulb Forty-Watt Tungsten Lamp.

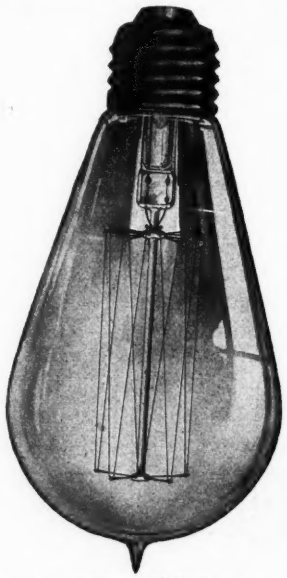
Several months ago a twenty-five-watt tungsten lamp was placed on the market with a bulb practically the same as used in the familiar sixteen-candlepower carbon lamp, and which could be used as a substitute for the carbon lamp in any fixture or shade. This lamp came into immediate favor and general use, but it lacked one of the chief advantages of tungsten-filament lamps—a large increase of illumination without increasing the current consumption.

The General Electric Company has recently placed on the market a small-bulb lamp with a forty-watt tungsten filament giving double the candlepower of the present sixteen-candlepower carbon lamps, but taking only four-fifths of the current. This lamp, when substituted for the carbon lamp, will, therefore, not only materially reduce the cost to the customer, but will greatly increase the standard of illumination by doubling the quantity and bettering the quality of the light given.

As seen from the accompanying illustration, which shows the lamp in about two-thirds size, the bulb and base are practically the same as that of the ordinary carbon incandescent lamp.

This new forty-watt lamp contains all of the many improvements in filament construction and methods of support perfected by the General Electric Company, and truly represents the latest and best development in tungsten-lamp manufacturing. Like other General Electric tungsten lamps, it can be burned in any position without affecting its life or candlepower, and its small bulb adapts it to all ordinary shades, chandeliers and brackets.

Its price is less than that of the regular large-bulb tungsten lamp with shoulder base, and the operating cost, including cost of lamp and current, is less than any incandescent lamp smaller than the sixty-watt tungsten. Furthermore, the customer is not required to include in the purchase of the lamp a new outfit of special fixtures, shades, etc. From a commercial standpoint, therefore, it should be the easiest selling lamp on the market and is of additional value to the central station in maintaining the revenue from its customers.

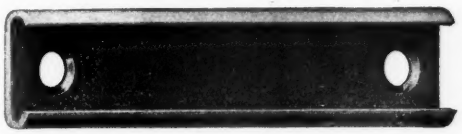


NEW SMALL-BULB FORTY-WATT TUNGSTEN LAMP.

The new small-bulb forty-watt lamp can be used in installations now using the old type with shoulder base and Holophane reflectors, by changing the shade-holder from the "H" type to the "O" type. This will raise the reflector around the lamp so as to bring the filament in the proper "focus" and obtain practically the same efficient distribution of light from the reflecting and refracting prismatic surfaces.

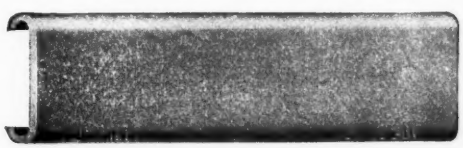
Metal Molding for Interior Wiring.

The ease of installing molding and the security of metallic conduits have been combined in a metal molding which has been put on the market by the National Metal Molding Company, of Pittsburg, Pa. This molding is made of two pieces, the base part and the capping. The former is provided with countersunk holes to accommodate screws for readily fastening it to walls or ceilings. When the base and base fittings are mounted and the wires placed therein, the capping is readily snapped on. The simplicity of the entire operation and the ease with which it is installed has created for this new product a considerable demand from wiremen.

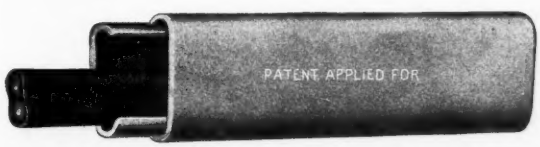


BASE PART OF METAL MOLDING.

The accompanying diagrams show the parts of the molding and a section of it as installed. The molding is made not only for straight runs, but all the regular fittings that are used in conduit work are made up in this material also. These extra fittings include base couplings that are installed beneath each joint of metal molding and fittings; clamps for fastening the molding; elbows, crosses, tees, junction boxes, rosettes, wall and ceiling brackets, and outlet boxes; also combination switch and outlet boxes, as well as all the regular fittings that have been found serviceable in conduit work.



CAPPING FOR METAL MOLDING.



VIEW OF METAL MOLDING ASSEMBLED.

All this metal molding and fittings are specially treated by the Sherardizing process of galvanizing, in which zinc dust is driven into the pores of the metal, thus giving an alloyed surface to the metal which is dustproof. This has been found much more durable and superior in every way than the old galvanizing material. It also produces a finish which is not injured by surface blows, by bending or twisting, or other hard usage, as well as exposure to the most severe atmospheric conditions.

The Crocker-Wheeler Company, Ampere, N. J.

The Crocker-Wheeler Company, Ampere, N. J., announces that the business booked during the week ending February 27 includes among other large orders on for two 100-kilowatt, 575-volt engine driven railway generators for the city of Edmonton, Montreal, Canada. The Michigan Alkali Company, Wyandotte, Mich., has placed an order for ninety-five horse-power in small motors with which to equip its plant. An order for eight Form W rolling-mill motors aggregating 170 horsepower has been placed by the Alliance Machine Company, Alliance, Ohio. A notable motor application will be that of the 125-horsepower, 230-volt motor to operate a friction saw which has just been ordered by the Pettibone-Mulliken Company, Chicago, Ill. The Hanover Street Trust, Boston, Mass., is adding a small three-wire balancer to its equipment.

A Subway for Newark, N. J.

The municipal committee of the newark (N. J.) Common Council, in conference with Mayor Jacob Hausslin, has approved a bill providing for the building of an underground street railway in that city, to relieve traffic conditions. The bill was drafted by City-Engigineer Morris R. Sherrerd, and will be introduced in the New Jersey Legislature soon.

It provides for the spending of not more than $2,000,000 in the construction of a subway, the money to be raised by an issue of temporary loan bonds, to beat not more than five per cent interest. Joint action between the Common Council and the Board of Works of Newark, is required under the bill's stipulations. The bill permits of the renting of the subway for a period of fifty years, with the right given the lessee to renew the lease for an additional half-century. With the experience of New York in mind the New Jersey Councillors have evidently made a bid in their favor by the fifty-year clause.

Pacific Coast Electric-Vehicle Convention.

A rather unusual convention was held in San Francisco, February 19 and 20, under the auspices of the Electric Storage Battery Company, manufacturer of the "Exide" battery. An invitation to this convention was extended to the central-station representatives in San Francisco, Los Angeles, San Diego, Portland, Seattle, Salt Lake City, and nearby cities, to the managers of electric-vehicle concerns in the same territory, to garage owners, vehicle users, etc.

The object of the convention was to bring together those interested in the electric automobile for the purpose of extending its use for commercial and pleasure work, and to impress upon the central-station operators the greatly increased revenue that can be secured from the results of a well-directed campaign.

Papers were read and discussed on "The Relation of Central Stations to the Automobile Business," "Electric Pleasure Vehicles," "Commercial Vehicles," and other topics. On Saturday following a ride in electric automobiles, a banquet was given at which the table was appropriately decorated, and a small electric motor car placed on a track encircling the table. This vehicle was utilized for the purpose of sending messages, cigars, etc., to guests about the table. A supper was given to the guests by the Studebaker Company on Friday evening. A permanent organization was formed and a committee appointed to draw up by-laws. Officers were elected, and Oakland was selected as the next meeting place.

Large Aluminum Combine.

Official confirmation of the reported combination of aluminum manufacturing concerns of the West has been made public. The deal was closed at a meeting held in New York, at which the Aluminum Goods Manufacturing Company was organized.

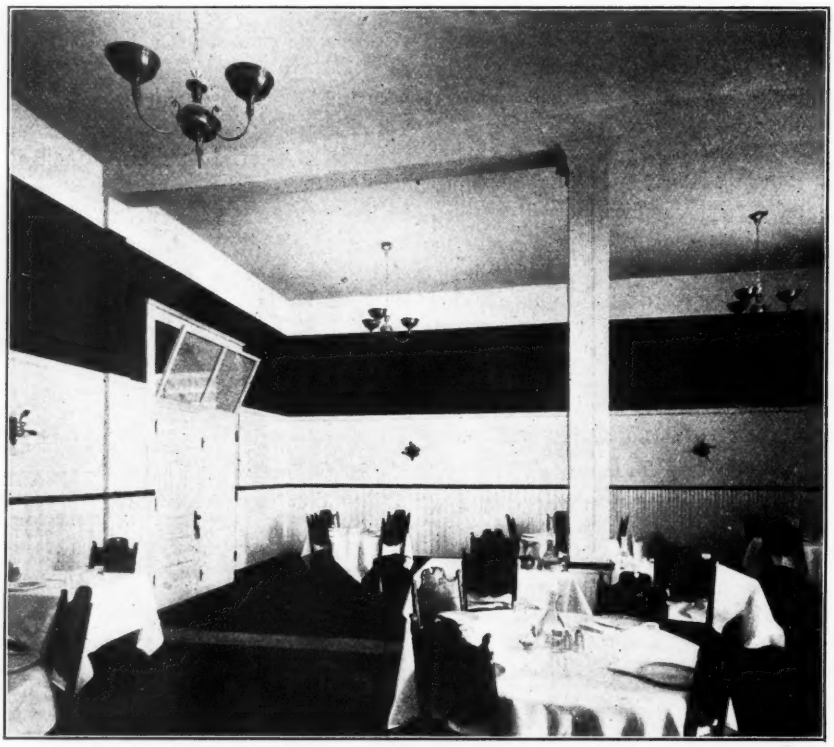
The combination includes the Manitowoc (Wis.) Aluminum Novelty Company, the Two Rivers (Wis.) Aluminum Comthe Two Rovers (Wis.) Aluminum Company and the New Jersey Aluminum Company, of Newark, N. J. The company is incorporated under the laws of New Jersey with a capital stock of $750,000.

G. A. Kruppschnitt of Newark, N. J., is president, and Joseph Koenig of Two Rivers, Wis., and George Vits of Manitowoc, Wis., are vice-presidents.

The "I-Comfort" System in a Hotel Dining Room.

The accompanying illustration, from a photograph, shows one of the dining rooms of the Chicago Beach Hotel, Chicago, in which is installed the new "I-Comfort" (eye-comfort) system of indirect illumination, made by the National X-Ray Reflector Company, Chicago, Ill.

The room is twenty-eight feet square with an eighteen-foot ceiling. This ceiling is light in color, acting as it does as the reflecting and diffusing illuminated surface in the "I-Comfort" system. Four three-unit fixtures are used in lighting this room. One fixture is placed in each square of the ceiling, each of the three units on the fixtures consisting of a 100-watt tungsten lamp mounted over a special silvered reflector bowl.



DINING ROOM OF THE CHICAGO BEACH HOTEL, CHICAGO, ILLUMINATED BY THE "I-COMFORT" INDIRECT SYSTEM WITH TUNGSTEN LAMPS.

The illumination is a radical change from the direct methods previously used and the comfort to the eye, as well as the satisfactory illumination of every object in the room, the guests find very noticeable.

This dining room was previously illuminated with ceiling and wall fixtures using forty sixteen-candlepower carbon-filament lamps, taking a total of 2,240 watts. Since the twelve 100-watt tungsten units require only 1,200 watts, a net saving of about 1,000 watts, or forty-five per cent, is effected.

It is stated that the effect produced by this indirect illumination was so novel and pleasing that the guests of the hotel, upon entering the dining room the first night the system was used, showed their appreciation by applause.

Some very large installations of the "I-Comfort" system of illumination are being made. Notably among these, both the buildings occupied by the American Radiator Company on Michigan Avenue, Chicago, as well as the Detroit and St. Louis salesrooms of the company, the Hamilton National Bank and the Chicago Title and Trust Company, and the Rookery and the Home Insurance Building, Chicago, are installing several hundred of these units, principally in the darker rooms.

Law Requires Electric Headlights.

The Brotherhood of Locomotive Engineers, which has been waging a fight before the North Carolina State Legislature, has won out in its efforts to secure electric headlights for its engines. The new law requires the use of electric headlights on all engines on through lines and on lines that are 115 miles long. The brotherhood took the position that the electric lights were a safeguard to life.

Western Electric Old-Timers.

On January 29, during the week the sales organization of the Western Electric Company, Chicago, Ill., held its conference in Chicago, some of the old employes of the Chicago organization gathered at luncheon at the Grand Pacific Hotel. While tidbits were being disposed of, many pleasant reminiscences were told of the pioneer days of telephony.

General regret was expressed that J. C. McDonnell, the traffic manager of the company, who was seriously ill, was unable to be present.

Those who attended the luncheon and the dates they entered the employ of the company are as follows: E. W. Bennett, 1874; J. C. Cannon (Jack), 1877; F. B. Uhrig, now western district supervisor of the company, located at Kansas City, 1881; D. L. Harmon (Denny), now a banker at Indiana Harbor, Ind., 1883; C. D. Wilkinson, manager of the Minneapolis house, 1886; Wm. Carpenter, of the Walworth & Neville Manufacturing Company, who entered the employ of the Western Electric Company in 1887; Rolo C. Hearsley, 1888; and E. S. Holmes (Fatty), now manager of the Indianapolis house, 1890.

Boston Edison Co-operates with Contractors and Supply Dealers.

One of the features of the campaign of publicity and co-operation for boosting the use of electricity in Greater Boston carried out by the Edison Electric Illuminating Company, of Boston, Mass., is the listing of electrical contractors and supply dealers, and the publishing, for free distribution of these lists from time to time, corrected up to date. This service affords an excellent opportunity for all to get together in pushing not only the stable articles, but any novelties that the manufacturers bring out from time to time.

Cutler-Hammer Company Opens Cleveland Office.

The Cutler-Hammer Manufacturing Company, Milwaukee, Wis., makers of electric controlling devices, announce the opening of a district office in Cleveland, Ohio, at 1108 Schofield Building. The new office will be in charge of C. J. Kruse, who comes from the engineering department of the Cutler-Hammer Company and who is well qualified to advise regarding the proper device to use in any case involving the control of electric motors.

Current Electrical News

CONTINENTAL EUROPE.

(Special Correspondence.)

PARIS, FEBRUARY 28.—The new aerial-cable tramway, which is now running up the Wetterhorn at Grindelwald, shows some original features. It mounts from the lower station at 1,273 metres in altitude, to the upper station at 1,678 metres in altitude. Between these two points there are stretched four cables, upon which the car runs on roller wheels. The car consists of an upper four-wheeled carriage placed upon the cable way, from which there hangs a small passenger car. At each station is a cable drum which carries the traction cable, this being attached to either end of the carriage. For operating the cable drum there is used a fifty-horsepower motor working on direct current at 800 volts. Three-phase current is delivered at 2,500 volts, from the Grindelwald plant, and through a rotary converter direct current is supplied for charging a storage battery which feeds the motor.

In the region of Innsbrück, Austria, there is being carried out the electrification of the line from Berg Isel to Hall. It is also intended to use electric power on the line from Berg Isel to the Hungerburg railroad. In the town of Oswiecim it is proposed to construct a short line of tramway in order to connect the railroad station with the centre of the town.

At a recent meeting of the Municipal Council of Paris the question of the use of the trolley within the city limits was discussed and it is probable that the zone which was already voted by the General Council will be maintained. This will confine the trolley to the outlying parts of the city, as before, as the Council has always been opposed to allowing its use in the main part of town.

Messrs. Blondel and Harlé have considerably modified their project of securing current for the supply of Paris from a hydraulic plant on the Rhone, near Geneva. The present project calls for a 350,000-horsepower turbine plant at Genissat, on French territory, using the three-phase system, with a power line running for 250 miles to Paris and working at 120,000 volts. Such a plant and power line would cost about $24,000,000.

A. DE C.

GREAT BRITAIN.

(Special Correspondence.)

LONDON, FEBRUARY 26.—In his presidential address to the Institution of Electrical Engineers at the beginning of the present session, it will be remembered that W. M. Mordey discussed the question of the amount of foreign electrical plant which is to be found in British central stations, and asserted that this only amounted to some few per cent. Against this, on the other side, it has been declared that in quite eighty per cent of British central stations German or other foreign electrical machinery is to be found. The matter was taken up by Mr. Chamberlain's tariff commission when a strong plea was entered—and published in a report—against the harm done to the electrical industry by the municipalities in Great Britain placing so many orders with foreign firms for this class of machinery. Mr. Mordey, however, has returned to the charge, for at two recent dinners he has asserted that the percentage of foreign electrical machinery in Great Britain is only between three per cent and five per cent of the whole. He further added that an equal amount of British electrical machinery is to be found in German power houses.

The government has under consideration the advisability of making it compulsory for steamship companies to carry wireless-telegraph outfits upon all passenger vessels.

The financial result of the Manchester electrical exhibition which was held last October is as follows: There remains a surplus sufficient to repay to the exhibitors twenty per cent of the amount which they paid for space as rent and ten per cent to those authorities which contributed toward the funds. There still stand over certain other sums which are to be divided among the benevolent institutions belonging to the electrical industry and an institution in the Manchester district.

Apropos of recent notes in this column upon the use of surface-contact tramway systems in Great Britain, Sir Alexander Kennedy has advised the Oxford Corporation to have nothing to do with any such systems. Sir Alexander Kennedy was the expert who recommended the use of the conduit system in London, where his advice was adopted, so far as the central districts were concerned. Now, however, there are several routes upon which the London County Council has adopted the overhead system, and in one part through-running between the overhead and the conduit is carried out. This is also done in one other town, Bournemouth.

A definite scheme for the adoption of the trolley-omnibus system is before the Middlesborough Council, the borough electrical engineer having made the recommendation.

G.

EASTERN CANADA.

(Special Correspondence.)

OTTAWA, MARCH 6.—A series of important experiments, said to be of a very encouraging character, have been made by the Lake Shore Railway, Quebec, in the application of wireless telegraphy to moving trains.

A bill to incorporate the Eastern Ontario Counties Electric Belt Line Company is before the present session of the Ontario Legislature. The capital stock of the company is to be $1,000,000. Contracts for disposing of electricity to municipalities, corporations and persons along the line of the projected railway will be made subject to the Hydroelectric Power Commission. Ottawa is to be the location of the head office of the company.

The railway statistical report for Canada, just presented to Parliament, shows that the mileage of electric railways in the Dominion last year increased from 814 to 992 miles. The total paid-up capital was $87,903,231, an increase of $12,707,756. Of the amount of public aid granted to electric roads during the fiscal year $118,400 was from the federal parliament, $306,945 from the provinces and $151,000 from municipalities. The floating debt was $5,363,319. Operating expenses amounted to $8,695,879, an increase of $958,625. The proportion of operating expenses to gross earnings was 62.08, the net earnings being $5,311,169. The electric railways carried during the year 199,099,309 passengers and 732,475 tons of freight, an increase of 26,099,905 passengers and 252,744 tons of freight. The employes on these roads totaled 9,954, and the pay list $5,757,578. In the year sixty-seven persons were killed, a decrease of four, and 1,883 injured, an increase of 147. Of the number of persons killed only eighteen were passengers.

The government of Nova Scotia has brought down to the Legislature a measure having for its object the establishment of a tribunal which will exercise effective control over public utilities in that province, including every concern engaged in the operation of a telephone service, and in the production of heat, light or power or supply of water, either directly or indirectly, for the public. The commission will consist of three members, to be appointed by the government. This board will have general supervision over all public utilities operating within the province and is empowered to enforce compliance with the law and with such regulations and orders as it may from time to time make. The principle underlying the bill is set forth as follows: "Every public utility is required to furnish reasonably adequate service and facilities. The charge made by any public utility for any heat, light, water or power produced, transmitted, delivered or furnished, or for any telephone message conveyed, or for any service rendered in connection therewith, shall be reasonable and just, and every unjust or unreasonable charge for such service is prohibited and declared unlawful."

W.

WESTERN CANADA.

(Special Correspondence.)

WINNIPEG, MARCH 6.—J. C. Kennedy, of the Stav Lake Power Company, Vancouver, British Columbia, has completed surveys and other arrangements for the development of electrical power for street railway and other purposes at Vernon, B. C.

The Calgary Power and Transmission Company, Calgary, Alberta, will at once begin work on its $1,000,000 power development scheme at Horseshoe Falls, and arrangements are now being made to call for the necessary tenders.

Surveys and other preliminaries have been started at Dog Lake Falls by the municipal authorities of Port Arthur, Ont., for the development of electrical power for municipal and domestic use in Port Arthur. Address Mayor Carrick.

English capitalists who own the Dawson City Electric Light and Power Company at Dawson City, Yukon, have decided to move the plant to Sourdough Coal Mine, a distance of forty miles. The plant will be considerably enlarged, and light and power will be distributed over a radius of 100 miles from the mine. It is estimated that the operating expenses of the plant will be less owing to the saving in haul of fuel, etc.

R.

Construction Notes.

ELECTRIC LIGHTING.

(Special Correspondence.)

OSSIAN, IOWA—The city of Ossian contemplates installing an electric-light plant. P.

SHANNON CITY, IOWA—An electric-light plant is projected at Shannon City.

ROCKWALL, TEX.—Briscoe Brothers are erecting an electric-light plant at Rockwall. P.

MANDAN, N. D.—The Mandan Electric Company is planning the enlargement of its plant. P.

FAIRMONT, NEB.—The Fairmont Water Company will install an electric-light plant at Fairmont. P.

WHARTON, TEX.—J. J. Wensley has been granted a fifty-year electric-light franchise at Wharton.

SCOTTS BLUFF, NEB.—B. A. Lathrop contemplates installing an electric-light plant at Scotts Bluff. P.

ROCKVILLE, MINN.—Klein & Tetting of Foley, Minn., have installed a lighting plant at Rockville. C.

GILBERT, MINN.—The Virginia Light and Water Company is seeking an electric-light franchise at Gilbert. P.

CROWELL, TEX.—L. G. Andrews and others have been granted an electric-light franchise at Crowell. P.

MARYVILLE, MO.—The Rockford Electric Light Company will rebuild its plant recently destroyed by fire. P.

SNYDER, TEX.—Snyder has granted a franchise for an electric-light plant to R. F. Brumbach of Ennis, Tex.

TABOR, IOWA—The Faith Home settlement in South Tabor is installing an electric-light plant to supply 100 lights. C.

CHICKASHA, OKLA.—The Chickasha Gas and Electric Light Company has been incorporated with a capital of $175,000. P.

CORDELL, OKLA.—The city of Cordell has granted a franchise to L. L. Landry and others for an electric-light plant. P.

RAMSAY, MICH.—An electric plant will be installed at the Eureka mine, of which Chas. C. Jones is superintendent. C.

NAUVOO, ILL.—The Nauvoo Electric Light and Power Company has increased its capital stock from $8,000 to $10,000.

IROQUOIS, S. D.—L. W. Liddle has been granted a twenty-year franchise for an electric-light system at Iroquois. P.

TERRELL, TEX.—Houston & Cunningham of New Orleans, La., have been awarded a contract for the building of an electric-light plant here.

GLENWOOD SPRINGS, COLO.—The Mutual Light, Heat and Power Company has been incorporated with a capital stock of $50,000. P.

JEFFERSON CITY, MO.—The Missouri Electric Company has been incorporated with a capital of $50,000 by H. B. Tyson and others. P.

CHESTER, PA.—The Beacon Electric Light Company, of Chester, is making preparations to make improvements costing $125,000 to its plant.

TONOPAH, NEV.—The Nevada-California Power Company has begun building its power line to Manhattan and Round Mountain from Tonopah. A.

FORT MORGAN, COLO.—The Colorado Power Company will extend its lines from Greeley to furnish power and light for Fort Morgan, Brush and Sterling.

LOS ANGELES, CAL.—The Hannon Water Company has been incorporated here with a capital stock of $6,000 by F. A., J. V., C. D., J. E. and F. Hannon. A.

MONTEZUMA, IOWA—Geo. W. Wiltse, John McDonald and others have incorporated the Montezuma Electric Light, Power and Heating Company with a capital of $6,000. C.

PERRYSBURG, O.—The village Council of Perrysburg has awarded the contract for lighting the streets at $50 per light. A. C. Tryon of Maumee was the successful bidder. H.

WILMINGTON, DEL.—The Albion Light and Power Company, Wilmington, has been incorporated with a capital of $100,000 by E. L. Lawrie, G. W. Dorsey, Jr., and W. G. Slayton.

LUZERNE, MICH.—The board of supervisors of Oscoda County has granted a franchise to the Eastern Michigan Power Company to build dams on the Au Sable River in that county.

EUGENE, ORE.—J. W. McArthur has filed notice of appropriation of 20,000 inches of water from Lake Creek for power purposes. The water will be diverted through a canal two miles long. A.

SCHUYLKILL HAVEN, PA.—At Schuylkill Haven the proposition to sell the municipal light plant was overwhelmingly defeated. The electors voted to increase the debt $11,000 to improve the plant.

WARSAW, IND.—William Thorn and other capitalists of this city have asked for a franchise to light the city. They propose to build and equip a power dam or hydraulic plant in the Tippecanoe River at Monoynet. S.

FARGO, N. D.—The Fergus Falls Light and Power Company of Fergus Falls, Minn., proposes to supply Fargo with electric light and power at three cents per kilowatt, transmitting the current sixty miles. C.

GILBERT, MINN.—The Gilbert Light and Water Company and the Virginia Light and Power Company have applied for electric-light franchises. Some of the business men favor the installation of a municipal plant. C.

TOLEDO, O.—George L. Lewis and Jacob Folgel of West Toledo have organized a lighting company. They hope to secure the West Toledo street-lighting contract, which Washington township is now advertising for. H.

DEFIANCE, O.—The plant of the People's Gas and Electric Company at Defiance will be sold at receiver's sale at 2 p. m. on April 8. The sale will be held on the premises. The property is appraised at $92,000 and is heavily bonded. H.

COLUMBUS, OHIO—The expenses of the municipal light for the month of January, including all sources of cost, were $4,354.20. At this rate there will be a balance in the fund when the first six months of the fiscal year are expired of $6,000 or $7,000.

ROSSVILLE, IND.—The Rossville Light and Heat Company is the name of a newly incorporated concern which proposes to build and equip a new plant in the town. James Silverthorn, James R. Crouse, M. W. Eaton and Noah Clark are the directors. S.

HELENA, MONT.—Articles of incorporation of the United Missouri River Power Company of New Jersey, which is a merger of the two Helena power companies, have been filed by S. T. Hauser and others. The capital is $10,250,000. G. H. Hill is state agent.

WENATCHEE, WASH.—The operation of the new power plant of the Great Northern Railroad, located in Tumwater Canyon, will be delayed probably two months owing to the partial destruction of the big standpipe when water was turned into it for a test.

NORTH YAKIMA, WASH.—The Central Washington Investment and Power Company has been incorporated at North Yakima with a capital stock of $100,000 by G. S. Rankin, Alexander McCreedy and J. Q. Cully. A power plant is to be built in the Moxee Valley. A.

SALT LAKE CITY, UTAH—The purpose of the Hyrum Bennion & Sons Company, just incorporated in Salt Lake City, is to deal in and operate flour mills, generate electricity, etc. The company will do business with a capital of $50,000. Hyrum Bennion is president.

BAKERSFIELD, CAL.—The Kern Power, Transit and Light Company has begun rebuilding its power line from the power house in the Kern River Canyon to Bakersfield. Five thousand new insulators and pins have been received and men are at work replacing the old line material. A.

NEW YORK, N. Y.—The Public Service Commission has replied to the writ of certiorari applied for by the Long Acre Electric Light and Power Company to compel a review in the courts of the testimony used in denying the application of the Long Acre Company to increase its securities.

NEWARK, OHIO—The Board of Public Service has ordered the closing of the municipal light plant. The board claims the plant is to be overhauled, but it is reported that there is no money in the city treasury available for the purpose. It is thought a lack of funds is responsible for the shut-down.

BEND, ORE.—The Crook County Light, Water and Power Company has been incorporated at Redmond, Ore., with a capital stock of $50,000 by the owners of the Cline Falls power site. J. H. Jackson of Redmond has been chosen president. A power plant is to be built at Cline Falls on the Deschutes River. A.

EATON RAPIDS, MICH.—The steel gates which regulate the flow of water for the roller mills and electric-lighting plant went out with an ice jam, putting the industries out of business and

doing a considerable amount of damage. The gates were weakened by the ice gorge last winter and the ice that broke up in the mill pond carried them away.

CHESTER, PA.—The Beacon Electric Light Company of Chester will let contracts for additional improvements to its plant on Second Street, between Edgemont Avenue and Market Street, which will amount to $150,000, with a view of accommodating its fast increasing trade and to give the city and its other customers the best possible service.

VINELAND, N. J.—The Maurice River Light, Heat and Power Company has been organized by E. C. Potter of Vineland, E. W. Mahoney of Avondale, Pa., B. F. Groff of Lancaster, Pa., and others. Over 1,200 acres of land has been purchased and will be flooded when a dam half a mile long is constructed. This dam will furnish a sixteen-foot water fall.

SAN FRANCISCO, CAL.—Judge de Haven has issued an order allowing Receiver Vanderlynn Stowe $5,000 per month for the maintenance of the property of the Tuolumne Water Power Company, and a similar order allowing Receiver Geo. H. Whipple, of the Stanislaus Electric Power Company, $12,000 per month for the maintenance of the property of that company. A.

BUTLER, N. J.—Papers of incorporation, forming a water and lighting company, have been filed by local capitalists. It is proposed to erect a dam on the property of W. L. McCue in West Milford Township and flood lands owned by F. R. Casterlin and Clarence E. Sehulster. It is capitalized at $100,000, with $22,000 paid in, W. L. McCue and F. R. Casterlin being the largest stockholders.

DENVER, COLO.—The Central Colorado Power Company has contracted to deliver electricity to the Wellington Mines Company of Breckenridge. A 200-ton stamp mill is to be operated. There are three sets of rolls, several screens, fifty-eight bucket elevators and three jigs of twelve compartments each. The cost of the mill is more than $100,000. The mine is a zinc-lead-copper-silver producer.

REDLANDS, CAL.—Steps have been taken in a conference between the officers of the Home Gas and Electric Company and a committee from the Redlands Board of City Trustees, that may result in Redlands calling for a bond issue for a municipal lighting plant. The meeting was at the suggestion of the Home company, and Mayor Kingsbury, J. J. Prendergast and R. M. Cheesman composed the committee.

WASHINGTON, D. C.—The House committee on rivers and harbors has concluded its consideration of the emergency and maintenance bill, carrying nearly $10,000,000. The bill will provide for the purchase, by condemnation proceedings, of the power plants operating along the St. Mary's Rapids, and also for the leasing of power privileges by the War Department after the requirements of navigation are fulfilled.

ST. CLOUD, MINN.—Articles of incorporation have been filed by the Sauk River Power Company, which was organized for the purpose of erecting and maintaining water and electric power plants in the state of Minnesota. The first plant will be established at Cold Springs and will supply the village with light and power. The incorporators are J. C. Enright of St. Cloud, A. C. Munck of Melrose, and L. J. Wahl of Cold Spring. The capital stock is $125,000.

GRASS VALLEY, CAL.—Chief Engineer Trow of the California Midland Railroad Company is making surveys for a twelve-mile ditch to carry water to generate several thousand electric horsepower at a point on the Yuba River, not far from Smartville. It is planned to take water just below the Colgate power plant and carry it to a place where a 400-foot drop will be obtained. The ditch is to be twelve feet wide at the bottom and the complete cost is estimated at $300,000. A.

NEWARK, N. J.—Newark citizens will vote on the proposition to erect a municipal lighting plant at a special election held May 4. The city has a section of the plant completed. After contracts were awarded for supplying the machinery the matter was submitted to the high courts and the plan of the city was defeated. It was then planned to take advantage of the provisions of the Jones act and hold a special election. The municipal plant, if erected, will be operated jointly with the sewer plant.

LANSING, MICH.—Chairman Curtiss, of the special waterways investigation committee of the Michigan Legislature, is preparing a bill to amend the law which gives boards of supervisors the authority to grant waterpower rights within the counties they serve. The bill will provide for a review of the petitions for water grants on franchises by the state railway commission, the commission not to approve unless suitable compensation is had and restrictive regulations surround the whole proposition to protect the people.

NEW CASTLE, PA.—A large electric plant, costing $250,000, is now being erected on the banks of the Big Run by the New Castle Portland Cement Company. It will furnish the motive power to operate the cement works, which will be ready for operation within a short time. The big electric plant is located about a quarter-mile east of Cascade Park. From there the electricity will be transmitted to the cement works. A large dam has been constructed to retain sufficient water during the low stages in the summer.

CHICAGO, ILL.—Executive committees of the four Chicago elevated roads will submit to the respective boards of directors at an early date the plan devised by Boisat, Cole and Insull for leasing the properties for a long term to a holding company on certain dividend guarantees. Metropolitan West Side Elevated directors will meet March 15, and the South Side and Oak Park Elevated directors' meetings fall due the last Thursday of this month. The regular quarterly meeting of Northwestern Elevated directors is not due until April, so a special meeting may be called.

LAPORTE, IND.—An amalgamation and consolidation of the various gas and electric plants in northern Indiana owned or controlled by Clarence H. Geist of Chicago and Philadelphia has been perfected under the name of the Northern Indiana Gas and Electric Company, with capital stock of $10,000,000. Frank J. Canall has been elected president and Rollo M. Cole, secretary. The new corporation absorbs the gas and electric plants at Michigan City, Hammond, Valparaiso, Indiana Harbor and East Chicago. The present local managements of the various plants will not be disturbed, but all will now be under one general management.

BURLINGTON, N. C.—The Southern Traction and Power Company has been incorporated with several million capital to develop a waterpower on Haw River, near Burlington. J. W. Murray is the principal promoter of the new enterprise, of which $2,500,000 stock is said to have been taken by New York capitalists. Holdings on which 1,400 horsepower can be developed have been secured, being located principally in Alamance County. The power to be developed will be disposed of to manufacturing towns in the vicinity. Application has also been filed for franchises to permit the company to build transmission lines through Reidsville, Wentworth and other towns in the state. L.

BOONEVILLE, ARK.—The Booneville Light & Water Company of Booneville, Ark., plans to build a waterpower electric plant, including an auxiliary steam power plant and waterworks system, estimated to cost $150,000, which will include a steel concrete dam about 350 feet long and 100 feet high, on a mountain stream fed by springs, which has a weir measurement of about 2,500 cubic feet per minute. A pipe line and a pole line will be built to supply the city of Booneville, about seven miles away, with both water and electricity. The water will flow by gravity and supply a pressure of about seventy-five pounds to the square inch at the fire hydrants in the city. It is expected to receive bids about May 1 for apparatus and construction. W. A. Fuller, Chemical Building, St. Louis, Mo., is engineer. John P. Thayer is president and W. Earl Harrell is secretary.

AUSTIN, TEXAS—The State of Texas will install in Austin a central electric-light and power plant and waterworks system to cost about $250,000, if a bill carrying that amount of appropriation for this purpose is passed by the Legislature, which is now in session. The bill was introduced by Senator Claude Hudspeth at the instance of Governor Campbell. The State's contract with the city of Austin for water, lights and power for the several state institutions expires in September of this year and it is planned to have the new plant ready for operation by that time. The Capitol building is already equipped with its own water and light plant, but if the new plant is installed this smaller plant will be abandoned. In view of the fact that the establishment of this proposed plant is an administration measure, its enactment by the Legislature is thought to be practically assured. D.

NORTH CHICAGO, ILL.—The chief of the Bureau of Navigation and the commandant of the Naval Training Station, Great Lakes, North Chicago, Ill., has published specifications for the outside lighting at the Naval Training Station, Great Lakes, North Chicago, Ill., for furnishing all material, labor, tools and appliances for the construction of a system of outside lighting, built with wires, cables, conduit, incandescent lamps, bracket fixtures, globes, brackets, manhole, ladders, etc., with connection to the cables placed by others and ready for attachment of arc lamps and operation by the government. There may be additional specifications for four cast-iron bridge newel-posts, built with wires and lamps for future erection, and 1,000 feet of one-and-one-half-inch iron conduit, 250 feet of vitrified-clay conduit (single-duct), and 1,300 feet of two-conductor, No. 8 lead-covered underground arc cables. The work will be located at the training station, thirty-two miles north of Chicago, and one mile south of North Chicago. Proposals will be received at the Bureau of Navigation, Navy Department, Washington, D. C., until 12 o'clock noon, March 24. Forms of proposals and specifications will be furnished upon application to the commandant, North Chicago, Ill.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

PRATTSVILLE, ARK.—A company is being organized by D. M. Kelly to establish a telephone system.

BROFY, N. D.—The Emmons County Telephone Company has been incorporated with a capital stock of $4,000. P.

PLOVER, WIS.—The Plover Telephone Company has been formed with a capital of $1,000 by S. B. Bell and others.

ST. JOSEPH, MO.—The Citizens' Telephone Company has increased its capital stock from $1,000,000 to $2,000,000. P.

APPLETON, WIS.—The Apple Creek Farmers' Telephone Company has been incorporated with a capital of $5,000.

PINE RIVER, MINN.—The Pine River Rural Telephone Company has been incorporated with a capital stock of $10,000.

NORTH PLATTE, NEB.—The South Side Mutual Telephone Company has been incorporated with a capital stock of $5,000. P.

WEATHERFORD, OKLA.—The Davis Bros. Telephone Company has been incorporated by James P., Arthur D. and Myrtle Davis.

ERHARD, MINN.—The Edwards Telephone Company has been organized and will construct a telephone line to Edwards. P.

PRESCOTT, ARIZ.—M. J. Hickey, Robert Brow and others have been granted an electric-light and telephone franchise at Prescott. P.

HURON, S. D.—The Bryant & Willow Lakes Mutual Telephone Company has been incorporated with a capital stock of $100,000. P.

DOXEY, OKLA.—The Beulah Telephone Company has been incorporated with $5,000 capital stock by Frank T. Alexander and others.

WAUSAU, WIS.—The Wausau Telephone Company has increased its capital from $20,000 to $80,000, and will build a fireproof exchange.

NEWTON, WIS.—The Newton-Manitowoc Telephone Company has increased its capital stock from $2,000 to $4,000, and will make extensions.

ELLERSON, VA.—The Hanover Telephone Company has incorporated with $5,000 capital stock. E. J. Flippo is president, and J. B. Bradley, treasurer.

CUMBERLAND, WIS.—The McKinley Telephone Company will increase its capital stock to $10,000, and will establish a local exchange at Cumberland.

COLUMBUS, OHIO—The United States Telephone Company has been authorized to increase its capital stock to $5,500,000 with an additional issue of $500,000.

MILES, IOWA—The Miles & Bryant Telephone Company, of Jackson County, has been incorporated by William Baty and others, with a capital stock of $500. C.

PERU, ILL.—The Cedar Point Telephone Company has been organized with a capital stock of $1,100, by Ellmore H. Whitaker, Robert H. Jonston and John Martins.

SAN LUIS OBISPO, CAL.—The Adelade Rural Telephone Company has been incorporated at San Luis Obispo by Otto Wyss, A. A. Dubost, W. I. Davis and others. A.

MINCO, OKLA.—The Consolidated Telephone Company has incorporated with $5,000 capital stock by F. G. Dennis, Mustang, Okla., and R. L. Bristow and A. C. Bristow, of Minco.

MERIDEN, IOWA—The Farmers' Telephone Company, of Meriden, has been formed with $5,000 capital stock. J. E. Wiese is president, D. F. Holly, secretary, and Robert Miles, treasurer.

DOWELLTOWN, TENN.—The Riverside Home Telephone Company has been incorporated with $3,000 capital stock by B. W. Robinson, James Davenport, Herman Williams and others.

NORMAN, OKLA.—The Norman Telephone Company will expend about $50,000 for improvements, including remodeling, installing metallic system and increasing switchboard facilities.

GOODWIN'S FERRY, VA.—The Spruce Run Mutual Telephone Company has incorporated with $5,000 capital stock. L. A. Kessinger is president, and J. D. Scott, secretary and treasurer.

ABILENE, KAN.—Work has begun on a copper trunk telephone line from Abilene to Wichita, where it will connect with trunk lines to Oklahoma and the southwest. Western Kansas is being covered with branch lines and the North and South movement of trunk lines has begun.

BALTIMORE, MD.—Edwin S. Canman, representing the Radio Wireless Telephone Company, has leased quarters on the banking floor of the Union Trust Company. The company will at once begin the erection of a tower on the roof of the Union Trust Building for service in connection with its work.

FORESTVILLE, WIS.—The Maplewood Western Telephone Company, of Forestville, has been incorporated with a capital stock of $500, by Gustav Leege, Charles Hoeppner and Henry Leege.

WAKEFIELD, VA.—The People's Telephone Company has been incorporated with $4,000 capital stock. J. A. Brittle is president, A. W. Holt, vice-president, and N. B. Bond, secretary and treasurer.

KINSTON, N. C.—The city contemplates voting on a $75,000 bond issue for the construction of a municipal telephone system, the extension of water, light and sewer systems and other improvements.

VIENNA, ILL.—The Johnson County Mutual Telephone Company, of Vienna, has been incorporated with a capital stock of $5,000, by J. Kuykendall, Guy Beauman, C. E. Farris, J. W. Casper and W. E. George.

FLAGG CENTER, ILL.—The Flagg Center Telephone Company has been capitalized at $3,500 to operate a telephone system. The incorporators are John Gibson, A. B. Eyster, John T. Lansden and Robert Gibson.

ROSEDALE, IND.—The Rosedale Telephone Company has incorporated to build an exchange and telephone lines in Rosedale and throughout Parke and Vigo counties. Fred. Wimmer, J. A. Taylor and L. L. Jacobs are directors. S.

EVANSVILLE, IND.—The Blue Grass Telephone Company, John Tilze, president, has secured a franchise to build a telephone line through Vanderburg County. The company will soon be in the market for material and equipment. S.

CELESTINE, IND.—The New Home Telephone Company, of Dubois County, has incorporated to build an exchange and telephone lines in Celestine and Dubois County. Ben. Nordhoff, George W. Jacobs and G. W. Rukes are directors. S.

NEW SCANDIA, MINN.—The Scandia Marine Telephone Company has been formed at New Scandia, with a capital of $12,000. The incorporators are A. P. Young, J. A. Hawkinson, Charles A. Mattson, F. G. Morrison and Henry A. Johnson.

TOLEDO, OHIO—The Ohio Legislature, seeking to punish eavesdropping when other persons are talking over the telephone, by a measure already passed by the upper house may make the intrusion a crime punishable by a maximum fine of $100. H.

STANTON, IOWA—The Stanton Central Telephone Association will construct telephone lines half-way to Red Oak and half-way to Elliott. The following have been elected officers for the ensuing year: A. A. Peterson, president; Samuel Mainquist, vice-president, and J. S. Olander, treasurer. C.

NEW YORK, N. Y.—The Stock Exchange has received formal notice from the Central & South American Telegraph Company of an increase in capital stock from $12,000,000 to $14,000,000, and from the Mexican Telegraph Company of an increase in capital stock from $3,000,000 to $5,000,000.

PALMYRA, IND.—The Flat Woods Independent Telephone Company has incorporated with the declared purpose of building and equipping telephone exchanges and united systems in Palmyra, Pekin, Bradford and other towns and communities in Harrison, Floyd, Washington and Clark counties. M. A. Smith, Lawrence Ellis, Joseph Uhl and others directors. S.

CRAWFORDSVILLE, IND.—The Home Telephone Company has accepted from the city a new franchise whereby its operation will be greatly enlarged. The company has offered the Bell Company $40,000 for its plant, including its switchboard, at this place. If this offer is not accepted the Home Company will, it is understood, be in the market for a new switchboard. S.

LITTLE FALLS, N. Y.—The managers of the local telephone and electric-light lines, as a result of their experience with sleet, are discussing electric subways in the city. It will take more than three months to bring the services to their former condition, and it is argued that it would be better to put in subways and be done with it. The matter will likely enough be brought before the Common Council at the next meeting.

ST. JOHN'S, NEWFOUNDLAND—Sir Robert Bond, premier of Newfoundland, announces that his government has agreed upon a contract with the Commercial Cable Company, by which the latter will extend one of its cables into Newfoundland and thence direct to New York city. Clarence H. Mackay, president of the Commercial Cable Company and of the Mackay Companies, has agreed to cut one of the five trans-Atlantic cables at a point about 300 miles east of Newfoundland, and there attach to the European end of the cable an entirely new cable, which will extend into St. John's, N. F., and thence direct from St. John's to New York city. This will enable the operation of the cable direct between New York city and Ireland with much greater accuracy and speed, and speed alone being increased over thirty-five per cent. This change means the purchase and laying of 1,700 miles of new cable.

ELECTRIC RAILWAYS.

(Special Correspondence.)

VANCOUVER, WASH.—A franchise has been granted to the Vancouver Traction Company for its new county and city electric-railway lines. A.

VALLEJO, CAL.—Randall, Wright & Trowbridge of Oakland have applied for a franchise for an electric road to White Sulphur Springs and Benicia. A.

PORTLAND, ORE.—The Portland Railway, Light and Power Company has asked for a thirty-year franchise to extend its lines through Fairview to connect with the O. R. & N. steam line. A.

NORTH BEND, ORE.—Seymour H. Bell, representing the Coos Bay Electric Company, has asked for a thirty-year franchise to construct an electric line from Marshfield to North Bend. A.

SACRAMENTO, CAL.—The Central California Traction Company has applied for a franchise in Sacramento to complete its Stockton-Sacramento road. It is rumored that this company, together with the Vallejo and Northern electric companies, will build a union depot near Eighth and I streets. A.

SHAMOKIN, PA.—Application has been made for a charter for a trolley road running from Monroe Township, Snyder County, to Lewisburg, by Boyd A. Musser, J. C. H. Newcomer, C. M. Clement, W. H. Lyons and Guy Webster. It is to be called the Sunbury, Lewisburg & Milton Railroad Company.

NEW YORK, N. Y.—The Public Service Commission has demanded of the New York & Queens County Railway Company, the road now operating trolleys in Queens, that it double-track its lines from Flushing to College Point and from Flushing to Jamaica. These territories are largely new land developments.

LAPORTE, IND.—Representatives of the Indiana Union Traction Company are reported to have asked for a franchise for a traction line through Laporte, Starke, Pulaski and Cass counties. It is said to be the purpose of the company to build an extension from Logansport to Laporte, by way of Winamac, Bass Lake and Knox. S.

BAKER CITY, ORE.—To build an electric railway from Portland and Baker City, Ore., to Butte, Mont., promoters of the Pacific Coast and Montana have incorporated with a capitalization of $2,000,000. The line will be over 500 miles in length, plans being already complete. The new system is to be started early this spring.

CHICAGO—The Chicago City Railway Company has let a contract to the Carnegie Steel Company of Pittsburg to equip its cars with steel wheels, which are expected to greatly improve the service, by reducing wear and consequent flat spots with their resulting noise. The contract calls for the delivery of 1,600 steel wheels a month.

GAINESVILLE, GA.—The holdings, etc., of the Gainesville Electric Railway Company have been sold at public auction by S. C. Dunlap, commissioner, to R. L. West of Atlanta for $80,000. The property is bonded at $250,000 and is said to be in excellent condition. Mr. West is manager of the General Contracting Company of Atlanta. L.

BOSTON, MASS.—The gross receipts of the Interborough Rapid Transit are showing larger increases than for many months. For the first seventeen days of February the gain in gross averaged $8,000 per day. In January the increase in gross was at the rate of $6,300 per day. Most of the gain is coming from the subway lines, with the elevated just about holding its own.

ALBANY, N. Y.—The Public Service Commission has issued an order directing the New York Central to put into effect on March 30 rules which will forbid employes of the road from getting on top of moving trains upon any portion of its lines within the electric zone, extending from the Grand Central Station to Croton-on-the-Hudson Division and to North White Plains on the Harlem line.

WASHINGTON, PA.—An ordinance has been passed by the Waynesburg Council granting a ninety-nine-year franchise to the Waynesburg & Monongahela Street Railway Company, which proposes, with Washington as a centre, to build lines to the Monongahela River, the Ten-Mile valley and other trade centres of Greene County. Work must be started on the road within sixty days and be completed in two years. W. J. Sheldon is promoter of the project.

ROCHESTER, IND.—The Circuit Court has appointed R. R. Carr of Akron receiver for the Wabash & Rochester Traction Company on complaint of the Stanly Brothers, contractors, who hold claims amounting to $7,000 against the company for work done on the roadbed on the company's right-of-way. It is rumored that the Winona Traction Company will purchase a portion of the Rochester company's incompleted road and use it for its Winona-Peru extension. S.

SPOKANE, WASH.—Articles of incorporation have been filed in the auditor's office for the Missoula Street Railway Company, with a capitalization of 100,000, all paid up. The principal place of business will be Spokane, and the company will buy rights-of-way and improve street-railway property. The trustees named are Jesse R. Wharton of Butte, Sidney R. Inch of Missoula, William A. Glide, Jr., of Los Angeles, Walter Bickford of Butte, and C. E. McBroom of Spokane.

BOSTON, MASS.—The New York, New Haven & Hartford Railroad must dispose of all its trolley holdings in Massachusetts before July 1, according to a decision of the Massachusetts Supreme Court. The decision is the result of the bill in equity brought by the attorney-general in May, 1908, and the court's decision applies to the Worcester & Southbridge, the Worcester & Blackstone Valley, the Worcester & Webster, the Webster & Dudley, the Springfield and the Berkshire Street Railway.

GREENVILLE, S. C.—The Town Council of Greenville has withdrawn the franchises of the Greenville Gas, Electric Light and Power Company and the Paris Mountain Water Company, declaring the same invalid and ordering that formal notice to this effect be served on the companies. Further, the chairman of the light committee of the Town Council was instructed to communicate with the Southern Power Company as to terms. A long-drawn litigation is expected to follow this move on the part of the city. L.

DOVER, DEL.—The Electric Railway Commission bill before the Delaware Legislature provides for a commission of five members, the governor to be president, and appoint the other four within thirty days after the passage of the act, with authority, after ten miles of a passenger and freight line have been built, to invest in three-per-cent bonds of the company, at the rate of $1,000 a mile, the total investment not to exceed $100,000. An appropriation of $500 is made for the expenses of the commissioners, who are to serve without pay.

EL PASO, TEXAS—The El Paso & Fort Hancock Electric Railway Company is pledged to begin the construction of its electric railway down the valley of the Rio Grande on or before March 28 or forfeit its bond for $10,000, which it has posted as a guaranty that the work will begin at the time stated. This proposed line will be more than fifty miles long and will run between El Paso and old Fort Hancock, traversing a part of the Rio Grande valley that is thickly settled. It is stated by the promoters of the project that the road has been financed and that it will be built in accordance with the terms of the franchise granted by the county. D.

SPOKANE, WASH.—Official announcement is made by M. Hall, president of the Spokane, Wallace & Interstate Railway Company, who is also manager of the Federal Mining and Smelting Company, in the Coeur d'Alenes, that the system, including an interurban line from Wallace to Spokane, eighty-five miles, and branch lines from Wallace to Burke and Mullan, Idaho, will be built this year. Work is to begin in June and the line will be rushed to completion. The survey follows the Coeur d'Alene valley, crossing the divide at a point between the Coeur d'Alene River and Wolf Lodge Bay, near Dudley, Idaho. It will skirt Coeur d'Alene Lake to the city of Coeur d'Alene, thirty-four miles east of Spokane.

ANDERSON, IND.—The annual meeting of the stockholders of the Union Traction Company and the Indiana Union Traction Company was held in the company's offices on March 3. The present board of directors were re-elected for each company. According to the financial statement, there is a deficit of $10,000 or more, but this is not regarded significant, considering the panic of the past year, and since the company was compelled to meet the expense of a stubborn labor strike. Notwithstanding these it was stated that the earnings would be sufficient to pay a dividend of one per cent July next. President Brady and his associate officers were thanked for their efficient management by the stockholders present. S.

OAKLAND, CAL.—The Southern Pacific Railway Company has given out additional details concerning the contracts for electrifying its suburban railways in Alameda County. The General Electric Company, Schenectady, N. Y., has secured the contract for the rolling stock, calling for forty-four multiple-unit four-motor cars, the contract price being $374,960. The stationary equipment in the power house, consisting of two 5,000-kilowatt turbo-generators, will be supplied by the Westinghouse Machine Company of East Pittsburg, Pa., at a contract price of $190,000. Steam for the operation of the turbo-generators will be supplied from a battery of twelve 645-horsepower water-tube boilers, which are to be installed by the Parker Boiler Company of Philadelphia at a cost of $137,000. The Henry R. Worthington Company of New York city, at a cost of $47,000, will supply two complete surface-condensing equipments. Work on the power house is being rushed and will be followed by the beginning of work on the overhead system for the electric trains. A.

PROPOSALS.

MOTOR FOR ROAD-MAKING MACHINERY.—C. O. Davidson, city clerk of Prince Albert, Saskatchewan, will receive tenders until March 18 for the supply of an electric motor to operate road-making machinery. R.

POLICE SIGNAL SYSTEM FOR VANCOUVER, B. C.—Sealed tenders will be received by William McQueen, city clerk, Vancouver, British Columbia, until March 25, for the installation complete of a police patrol signal system for Vancouver. Plans and specifications may be seen at the office of the city electrician. R.

STACK AT UNITED STATES ASSAY OFFICE, NEW YORK CITY—The office of the Supervising Architect, Washington, D. C., will receive sealed proposals until April 1 for the construction of the stack in connection with the extension and remodeling of the United States Assay Office Building, at New York, N. Y., in accordance with specifications, which can be obtained from the office of the Supervising Architect.

UNITED STATES POST OFFICE AT ATLANTA, GA.—The Office of the Supervising Architect, Washington, D. C., will receive sealed proposals until March 26 for the installation of a vacuum-cleaning system for the United States Post Office and Court House at Atlanta, Ga., in accordance with drawings and specifications, copies of which may be had at this office, or at the office of the superintendent, Atlanta, at the discretion of the Supervising Architect.

QUARTERS AT ARMY HOSPITAL, WASHINGTON, D. C.—Sealed proposals will be received at the office of the Constructing Quartermaster until March 31 for the construction, including plumbing, heating, electric wiring and electric lighting fixtures, of two single sets officers' quarters, one hospital corps barracks, one storehouse, one stable and one wagonshed and garage at the Walter Reed Army General Hospital, Washington, D. C. Plans, specifications, blank proposals and further information furnished on application. Address proposals to H. L. Pettus, constructing quartermaster.

DISTRIBUTION AND LIGHTING SYSTEM FOR CADET CAMP, WEST POINT, N. Y.—Sealed proposals, in triplicate, subject to the usual conditions, will be received at the office of the Quartermaster, West Point, N. Y., until March 19, for furnishing and installing an electrical distributing and street-lighting system for the Cadet Camp, as per drawings and specifications. Proposals from manufacturers of electrical cable only will be considered. The United States reserves the right to accept or reject any or all proposals. Forms furnished upon application. Address Quartermaster, West Point, N. Y.

POST OFFICES AT MARION, OHIO, AND DOTHAN, ALA.—The office of the Supervising Architect, Washington, D. C., will receive sealed proposals until April 5 for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of the United States post offices at Marion, Ohio, and Dothan, Ala., in accordance with specifications, which may be obtained from the custodian of the respective sites, or at the office of the Supervising Architect.

LEGAL NOTE.

BASSETT PATENT—In the United States Circuit Court for the Northern District of Illinois, the judge filed a decree in the case of the General Electric Company against the Morgan-Gardner Electric Company on Bassett patent, 56,792, granted March 20, 1894. This decree is the outcome of a suit brought by the General Electric Company to restrain the Morgan-Gardner Electric Company from alleged infringement of the Bassett patent in the manufacture and sale of certain electric motors for use on electric mining locomotives. The court holds that the patent is valid and the defendant has infringed. The Bassett patent relates to a form of railway motor in which the field frame is diagonally split so as to allow ready access to the armature or interior parts of the motor, without removing the motor from the locomotive or car to which it is attached, and in which the parts are thoroughly protected from injury.

ELECTRICAL SECURITIES.

The inauguration of President Taft overshadowed other events in the stock market last week, the inaugural address, in the main, meeting with satisfaction. Such change in business as can be measured is certainly for the better, and even in the ultra-conservative banking quarters predictions are made of a season of the greatest industry and prosperity.

Dividends have been declared upon the following electrical securities: Philadelphia Traction Company; the regular semi-annual dividend of $2 a share. The regular dividend of one per cent on the preferred shares and regular quarterly dividend of one per cent on the common shares in the Mackay Companies will be paid April 1, 1909, to shareholders of record as they appear at the close of business March 13, 1909.

ELECTRICAL SECURITIES FOR THE WEEK ENDED MARCH 6.

New York:	*Closing.*
Allis-Chalmers common	13⅞
Allis-Chalmers preferred	44½
American Tel. and Tel. Company	128¼
Brooklyn Rapid Transit	72½
General Electric	153
Interborough-Metropolitan common	14¾
Interborough-Metropolitan preferred	41⅝
Kings County Electric	125
Mackay Companies (Postal Telegraph and Cable) common	72¾
Mackay Companies (Postal Telegraph and Cable) preferred	70¾
Manhattan Elevated	145
Metropolitan Street Railway	28
New York and New Jersey Telephone	110
Western Union	65¼
Westinghouse Manufacturing Company	77

Boston:	*Closing.*
Edison Electric Illuminating	253½
Massachusetts Electric	72
New England Telephone	133
Western Telephone and Telegraph pref	78

Philadelphia:	*Closing.*
Electric Company of America	11⅝
Electric Storage Battery common	46
Electric Storage Battery preferred	46
Philadelphia Electric	11½
Philadelphia Rapid Transit	27½
United Gas Improvement	89¾

Chicago:	*Closing.*
Chicago Telephone	131½
Commonwealth Edison	109⅛
Metropolitan Elevated preferred	46
National Carbon common	82
National Carbon preferred	110

DATES AHEAD.

Railway Signal Association. Stated meeting, Auditorium Hotel, Chicago, Ill., March 15.

American Railway Engineering and Maintenance of Way Association. Annual convention, Chicago, Ill., March 16-18.

Ohio Independent Telephone Association. Annual convention, Columbus, Ohio, March 18.

Minnesota Electrical Association. Second annual meeting, Nicollet Hotel, Minneapolis, Minn., March 18-19.

Worcester Mechanical and Electric Exposition. Mechanics' Hall, Worcester, Mass., March 27-April 3.

Louisville Electrical Show. The Armory, Louisville, Ky., April 12-24.

Missouri Electric Light, Gas and Railway Association. Annual convention, Springfield, Mo., April 15-17.

Iowa Electrical Association. Annual convention, Cedar Rapids, Iowa, April.

Southwestern Electrical and Gas Association. Annual convention, Dallas, Tex., May.

American Electrochemical Society. Next meeting, Niagara Falls, Ontario, May 6-8.

Omaha Electrical Show. Omaha Auditorium, Omaha, Neb., May 6-15.

American Association of Electric Motor Manufacturers. Annual convention, Hot Springs, Va., May 18-20.

Ohio Society of Mechanical, Electrical and Steam Engineers. Annual convention, Canton, Ohio, May 21-22.

Association of Edison Purchasing Agents. Annual convention, Atlantic City, N. J., June 1-4.

National Electric Light Association. Annual convention, Atlantic City, N. J., June 1-4.

American Railway Master Mechanics' Association. Annual convention, Atlantic City, N. J., June.

Master Car Builders' Association. Annual convention, Atlantic City, N. J., June.

American Institute of Electrical Engineers. Annual convention, Thousand Islands, N. Y., June 28.

Ohio Electric Light Association. Annual convention, Toledo, July 13-15.

National Electrical Contractors' Association. Annual convention, Toledo, Ohio, July 21-23.

PERSONAL MENTION.

MR. WILLIS RUSSELL, who retired as general superintendent of the line of the Kenosha Electric Railway Company on March 1, has been named as the general manager and superintendent of the Elgin & Belvidere Interurban Line.

MR. PERY FITZ-PATRICK ROWELL has been appointed secretary of the Institution of Electrical Engineers to succeed Mr. George C. Lloyd, who has become secretary of the Iron and Steel Institute. Mr. Rowell has been associated with the secretary's office since 1901, being assistant secretary of the institution for the last five years.

MR. M. B. LARRIMORE has resigned his position as superintendent of the Home Telephone Company, of Fort Wayne, Ind., to join the Protective Electrical Supply Company of the same city, of which he has been elected president. Mr. E. M. Popp, auditor of the telephone company, has tendered his resignation and will act as secretary-treasurer of the electrical company.

MR. H. C. SLEMIN, in addition to his duties as advertising manager, has been appointed sales manager of the Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y. Mr. Slemin is one of the most enterprising of the aggressive and business-building personnel of this fortunate company, and his fulfilling of the duties of these offices lends strength to the organization.

MR. R. A. McLAUGHLIN, for five years general superintendent of the street-car, electric-light and gas interests at Galesburg, Ill., has submitted his resignation, to take effect on April 1. General Manager Chubbuck, of the Illinois Traction System, has asked him to take charge of the construction of the building of the interurban line between Streator and Ottawa and between Seneca and Morris, work to be done this year.

COL. W. T. GENTRY has been elected president of the Southern Bell Telephone Company, with offices in Atlanta, Ga. He will, however, be called upon to spend much of his time in New York. Colonel Gentry, it is understood, will continue to carry out the established progressive policy of the company. J. Epps Brown and J. M. B. Hoxsey, elected vice-president and general manager, respectively, will also continue to reside in Atlanta. L.

MR. HENRY M. HUXLEY, A. M. (Harvard, 1902), has become associated with the patent law offices of Brown & Williams, Monadnock Block, Chicago. Mr. Huxley was connected with the operating department of the American Steel and Wire Company at Worcester, Mass., in various capacities for four years, and was later assistant general manager and manufacturer of the Duplex Metals Company at New York. Mr. Huxley will make a specialty of the prosecution of applications for chemical and metallurgical patents, with particular reference to those dealing with the manufacture of iron, steel and wire products.

MR. HENRY L. SHIPPY announces that the condition of his health is such that he feels it necessary to be relieved from active business cares, and has, therefore, resigned as treasurer of John A. Roebling's Sons Company of New York. Mr. Shippy's connection with the Roebling Company began in 1875 and has continued without interruption since that time. He asks for his successor, Mr. W. P. Bowman, formerly manager of the Cleveland branch of the Roebling Company, the same co-operation and hearty good will that has been given to himself by business interests all over the world during this period of service. In thus announcing Mr. Shippy's plans the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN joins with his friends in the earnest hope that he will speedily find new health and that he may long enjoy a well-earned vacation. He has won for himself the admiration and esteem of his business associates and he has become endeared to a host of close friends and acquaintances.

NEW MANUFACTURING COMPANIES.

BUFFALO, N. Y.—The Kaiser Device and Electric Company has been incorporated for the purpose of manufacturing electric devices, etc. Capital, $100,000. Incorporators: E. D. Klopp, F. Kaiser, C. D. Coyle, Buffalo.

INDIANAPOLIS, IND.—The Indianapolis Railway Equipment Company has incorporated to manufacture railway mail equipment and supplies especially adapted to interurban-railway mail service. The company is incorporated at $100,000. W. A. Zumppe, E. L. Killen and E. R. Treat are directors. S.

DOVER, DEL.—Articles of incorporation have been filed for the American Electric Fire Alarm Manufacturing Company of Pittsburg to manufacture, sell and deal in electric fire alarms, etc. The incorporators are Charles H. Hallowell, Carnegie, Pa.; William Johnson, Bellger, Pa., and John C. Miller, Beaver, Pa. Capital stock, $500,000.

INDUSTRIAL ITEMS.

THE NATIONAL METAL MOLDING COMPANY, Pittsburg, Pa., manufacturer of Economy conduit, has removed its San Francisco office to the Merritt Building in that city.

THE F. BISSELL COMPANY, Toledo, Ohio, in its March calendar card points a moral that it is "plugging along" in offering good material, quick shipments and right prices.

THE STAVE ELECTRICAL COMPANY, 27 West Twenty-seventh Street, New York city, announces that the Robertson Electric Company, 15 Terrace, Buffalo, N. Y., has been appointed its representatives for western and northern New York.

THE METROPOLITAN ELECTRICAL SUPPLY COMPANY, of Chicago, Ill., has issued a special bulletin describing an electrical washing machine, for which it is the selling agent. Bulletins and prices will be forwarded to anyone on request.

THE ELECTRIC MACHINERY COMPANY, Minneapolis, Minn., has arranged Bulletin No. 105 on the subject of its revolving-field alternators. The machines listed include the line of exciters applicable to this class of generators, and a number of names are given of users of Electric Machinery appliances.

THE BURLINGAME UNDERWRITERS, Chronicle Building, San Francisco, Cal., have prepared some interesting literature on the subjects of the Burlingame telegraphing typewriter, the invention of Elmer Burlingame, and the organization of the company which is manufacturing and introducing the machine.

THE F. W. WAKEFIELD BRASS COMPANY, Vermilion, O., has issued a bulletin describing its handsome line of tungsten fixtures. The Wakefield detachable link chain is so constructed that each link can be easily detached or removed, thereby making it possible to lengthen or shorten the fixture to meet all requirements.

ROTH BROS. & COMPANY, Chicago, Ill., have prepared bulletins Nos. 181, 199 and 156 on the subjects of their vertical-shaft motors, band-saw motors and electric grinding and polishing machines. The company has been making several changes in its manufacturing departments and will soon occupy a new factory with greatly enlarged facilities.

THE PETTINGELL-ANDREWS COMPANY, Boston, Mass., has continued the series of striking cover designs for its monthly house organ, *Juice*, and on the March cover page presents a realistic representation of the electrical display from a sleet-covered trolley. Pittsburg transformers, street and interior lighting fixtures, weather-proof, high-tension fuses, steel shades, ground clamps and boring machines comprise the contents of the inner pages.

THE TUNGSTOLIER COMPANY, Cleveland, Ohio, a selling organization marketing every form of electric illuminating device, especially fittings for tungsten-lamp installations, has issued a striking folder in which it calls attention to some of its artistic tungstoliers. As contained in an announcement in this folder, the Tungstolier Company refrains from selling direct to the consumer, but operates a large publicity campaign to educate and interest the consumer for the benefit of the local contractor or dealer.

THE CHICAGO FUSE WIRE AND MANUFACTURING COMPANY, Chicago, is mailing its new No. 23 catalogue, covering the entire line of switch and outlet boxes for both rigid and flexible conduit. Cuts are shown of every standard cover made, giving detailed dimensions. The switch boxes for flexible conduit are made in various depths and equipped with either of three standard ears, making it possible for the contractor to select boxes suitable for the particular requirements of almost any installation. The company is also prepared to furnish outlet boxes, galvanized by the Sherardizing process, which insures thorough coating on the inside as well as on the outside.

THE GENERAL COMPRESSED AIR AND VACUUM MACHINERY COMPANY, St. Louis, Mo., has published an attractive bulletin on the subject of the Thurman portable electric vacuum cleaner. The booklet illustrates the uses of the machine and describes the various tools employed for cleaning special surfaces. A special instrument can be used in connection with the vacuum system for facial and body massage. The Thurman portable cleaner comprises a motor-driven exhauster and receiver mounted on a light carriage. The complete device weighs about seventy pounds and occupies a floor space about sixteen by twenty-four inches.

THE CROCKER-WHEELER COMPANY, Ampere, N. J., has recently taken an order for both an 800-kilowatt and a seventy-five-kilowatt, 250-volt generator for the Emerson Manufacturing Company, Rockford, Ill. Another is for a 300-kilowatt, 125-volt lighting and power generator for the Oakville Company, Oakville, Conn. The High Standard Steel Company of Rockaway, N. J., has purchased two 125-kilovolt-ampere, 2,300-volt, sixty-cycle alternators of the coupled type. Two fifty-kilowatt turbo-generators have been ordered for the De Laval Steam Turbine Company, Trenton, N. J., and several engine-type generators of

moderate size, among which are a seventy-five-kilowatt for the Franklin Square House, Boston, and a fifty-kilowatt for the Enterprise Building Company, Fall River, Mass. Eight motors for printing presses have been ordered for Clark & Cox, Denver, Colo. Among other orders are one for three ten-horsepower elevator motors for the Ogden Iron and Steel Manufacturing Company, New York city, and a forty-horsepower induction motor for the Stiles & Hart Brick Company, Wier Branch, Mass. The sales of small direct-current motors still continue to increase, the company reports.

THE "TUBA" GLUEH LAMPENFABRIK, 4 Lutzowstrasse, Berlin, Germany, has recently brought out a new form of incandescent lamp in which the vacuum bulb is a U-shaped tube surrounding the filament which is of the hair-pin form. The vacuum bulb can be surrounded by an outer globe so that the lamp presents an appearance similar to that of the ordinary incandescent light. The filament furnishes a pure white light and effects a saving of sixty per cent over the ordinary lamp, the manufacturer declares. The light-efficiency is 1.6 to 1.8 watts per candlepower and the lamp has a life of 600 hours.

Directory of Electrical and Allied Engineering and Scientific Societies.

(Published in the second issue of each month.)

ALABAMA LIGHT AND TRACTION ASSOCIATION. Secretary, Lloyd Lyon, secretary and auditor Mobile Light and Railway Company, 158 Government Street, Mobile, Ala.

AMERICAN ASSOCIATION OF ELECTRIC MOTOR MANUFACTURERS. Secretary, W. H. Tapley, Walker Electric Company, Twenty-third and Noble streets, Philadelphia, Pa. Annual convention, Hot Springs, Va., May 17-20.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

AMERICAN ELECTROCHEMICAL SOCIETY. Secretary, Dr. J. W. Richards, Bethlehem, Pa. Next regular meeting, Niagara Falls, Ontario, May 6-8.

AMERICAN ELECTROTHERAPEUTIC ASSOCIATION. Secretary, Dr. Albert C. Geyser, 352 Willis Avenue, New York city.

AMERICAN FOUNDRYMEN'S ASSOCIATION. Secretary, Dr. Richard Moldenke, Watchung, N. J.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Secretary, Ralph W. Pope, Engineering Societies Building, 29 West Thirty-ninth Street, New York city.

AMERICAN INSTITUTE OF MINING ENGINEERS. Secretary, Rossiter W. Raymond, 29 West Thirty-ninth Street, New York city.

AMERICAN MATHEMATICAL SOCIETY. Secretary, F. N. Cole, 50 West 116th Street, New York city.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION. Secretary, J. W. Taylor, Old Colony Building, Chicago, Ill. Annual convention, Atlantic City, June.

AMERICAN ROENTGEN-RAY SOCIETY. Secretary, Dr. G. C. Johnson, 514 Bijou Building, Pittsburg, Pa.

AMERICAN SOCIETY FOR TESTING MATERIALS. Secretary, Prof. Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Secretary, Calvin W. Rice, 29 West Thirty-ninth Street, New York city.

AMERICAN SOCIETY OF CIVIL ENGINEERS. Secretary, Charles Warren Hunt, 220 West Forty-seventh Street, New York city.

AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS. Secretary, A. P. Folwell, Flatiron Building, New York city.

AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION. Secretary, B. V. Swenson, Engineering Societies Building, 29 West Thirty-ninth Street, New York city.

AMERICAN STREET AND INTERURBAN RAILWAY ACCOUNTANTS' ASSOCIATION. Secretary, H. E. Weeks, secretary and treasurer Tri-City Railway Company, Davenport, Iowa.

AMERICAN STREET AND INTERURBAN RAILWAY CLAIM AGENTS' ASSOCIATION. Secretary, B. B. Davis, claim agent Columbus Railway and Light Company, Columbus, Ohio.

AMERICAN STREET AND INTERURBAN RAILWAY ENGINEERING ASSOCIATION. Secretary, J. W. Corning, electrical engineer Boston Elevated Railway Company, Boston, Mass.

AMERICAN STREET AND INTERURBAN RAILWAY TRANSPORTATION AND TRAFFIC ASSOCIATION. Secretary, B. V. Swenson, Engineering Societies Building, 29 West Thirty-ninth Street, New York city.

AMERICAN STREET AND INTERURBAN RAILWAY MANUFACTURERS' ASSOCIATION. Secretary, George B. Keegan, 2321 Park Row Building, New York city.

ARKANSAS ASSOCIATION OF PUBLIC UTILITY OPERATORS. Secretary, J. E. Cowles, superintendent of lighting Hot Springs Light and Railway Company, Hot Springs, Ark.

ARKANSAS INDEPENDENT TELEPHONE ASSOCIATION. Secretary, Charles F. Speed, Texarkana, Ark.

ASSOCIATION OF CAR-LIGHTING ENGINEERS. Secretary, G. B. Colegrove, Illinois Central Railroad, Chicago, Ill.

ASSOCIATION OF EDISON ILLUMINATING COMPANIES. Secretary, D. L. Huntington, second vice-president and manager Washington Water Power Company, Spokane, Wash.

ASSOCIATION OF ELECTRIC LIGHTING ENGINEERS OF NEW ENGLAND. Secretary, Welles E. Holmes, 308 Washington Street, Newton, Mass.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS. Secretary, P. W. Drew, Wisconsin Central Railway, Milwaukee, Wis.

CALIFORNIA ELECTRIC RAILWAY ASSOCIATION. Secretary, L. E. W. Pioda, Oak and Broderick streets, San Francisco, Cal.

CALIFORNIA INDEPENDENT TELEPHONE ASSOCIATION. Secretary, P. T. Whittier, Spencer, Cal.

CANADIAN ELECTRICAL ASSOCIATION. Secretary, T. S. Young, Toronto, Canada.

CANADIAN STREET RAILWAY ASSOCIATION. Secretary, Acton Burrows, 33 Melinda Street, Toronto, Ontario.

CENTRAL ELECTRIC RAILWAY ASSOCIATION. Secretary, A. L. Neereamer, Traction Terminal Building, Indianapolis, Ind.

COLORADO ELECTRIC LIGHT, POWER AND RAILWAY ASSOCIATION. Secretary, J. C. Lawler, Colorado Springs, Colo.

CONNECTICUT STATE STREET RAILWAY ASSOCIATION. Secretary, F. W. Poole, Bridgeport, Conn.

ELECTRIC CLUB OF CHICAGO. Secretary, Wm. S. Taussig, 204 Dearborn Street, Chicago, Ill.

ELECTRIC CLUB OF CLEVELAND. Secretary, George L. Crosby, 1200 Schofield Building, Cleveland, Ohio.

ELECTRICAL CONTRACTORS' ASSOCIATION OF NEW YORK STATE. Secretary, George William Russell, Jr., 500 Fifth Avenue, New York city.

ELECTRICAL CONTRACTORS' ASSOCIATION OF STATE OF MISSOURI. Secretary, Charles J. Sutter, 1220 Pine Street, St. Louis, Mo.

ELECTRICAL TRADES ASSOCIATION OF CHICAGO. Secretary, Frederic P. Vose, Marquette Building, Chicago, Ill.

ELECTRICAL TRADES ASSOCIATION OF PHILADELPHIA. Secretary, E. A. Symmes, 810 Drexel Building, Philadelphia, Pa. Meetings, second and fourth Thursdays of each month.

ELECTRICAL TRADES ASSOCIATION OF CANADA, LIMITED. Secretary, William R. Staveley, Royal Insurance Building, Montreal, Canada.

ELECTRICAL TRADES ASSOCIATION OF THE PACIFIC COAST. Secretary, Albert H. Elliott, Harding Building, San Francisco, Cal. Monthly meetings, San Francisco, Cal., first Thursday of each month.

ELECTRICAL TRADES SOCIETY OF NEW YORK (Member National Electrical Trades Association). Secretary, Franz Neilson, 80 Wall Street, New York city. Board of directors meets second Friday of each month.

EMPIRE STATE GAS AND ELECTRIC ASSOCIATION. Secretary, Charles H. B. Chapin, 154 Nassau Street, New York city.

ENGINE BUILDERS' ASSOCIATION OF THE UNITED STATES. Secretary, J. I. Lyle, 39 Cortlandt Street, New York city.

ENGINEERS' CLUB OF PHILADELPHIA. Secretary, H. G. Perring, 1317 Spruce Street, Philadelphia, Pa.

ENGINEERS' SOCIETY OF MILWAUKEE. Secretary, W. Fay Martin, Milwaukee, Wis.

ILLINOIS INDEPENDENT TELEPHONE ASSOCIATION. Secretary, C. A. Camp, Henry, Ill.

ILLINOIS STATE ELECTRICAL ASSOCIATION. Secretary, H. E. Chubbuck, Ottawa, Ill.

ILLUMINATING ENGINEERING SOCIETY. Secretary, Van Rensselaer Lansingh, Engineering Societies Building, 33 West Thirty-ninth Street, New York city.

INDEPENDENT TELEPHONE ASSOCIATION OF TEXAS AND LOUISIANA. Secretary, C. A. Shock, Sherman, Tex.

INDIANA ELECTRIC LIGHT ASSOCIATION. Secretary, Frederic Leslie, Muncie, Ind. Next meeting, August 18.

INDIANA INDEPENDENT TELEPHONE ASSOCIATION. Secretary, Allen J. Paylow, Rockport, Ind.

INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS. Secretary, Frank P. Foster, Corning, N. Y.

INTERNATIONAL INDEPENDENT TELEPHONE ASSOCIATION. Secretary, A. C. Davis, Parkersburg, W. Va.

IOWA ELECTRICAL ASSOCIATION. Secretary, W. N. Keiser, Des Moines, Iowa. Annual convention, Cedar Rapids, Iowa, April.

IOWA INDEPENDENT TELEPHONE ASSOCIATION. Secretary, W. J. Thill, Des Moines, Iowa.

IOWA STREET AND INTERURBAN RAILWAY ASSOCIATION. Secretary, L. D. Mathes, Dubuque, Iowa.

KANSAS GAS, WATER, ELECTRIC LIGHT AND STREET RAILWAY ASSOCIATION. Secretary, James D. Nicholson, Newton, Kan.

KENTUCKY INDEPENDENT TELEPHONE ASSOCIATION. Secretary, W. G. Turpine, Henderson, Ky.

MAINE INDEPENDENT TELEPHONE ASSOCIATION. Secretary, M. E. Crow, Houlton, Me.

MAINE STREET RAILWAY ASSOCIATION. Secretary, E. A. Newman, 471 Congress Street, Portland, Me.

MASSACHUSETTS STREET RAILWAY ASSOCIATION. Secretary, Charles S. Clark, 70 Kilby Street, Boston, Mass. Meets second Wednesday of each month, except July and August.

MASTER CAR BUILDERS' ASSOCIATION. Secretary, J. W. Taylor, 390 Old Colony Building, Chicago, Ill. Annual convention, Atlantic City, June.

MICHIGAN ELECTRIC ASSOCIATION. Secretary, A. C. Marshall, Port Huron, Mich.

MICHIGAN INDEPENDENT TELEPHONE ASSOCIATION. Secretary, A. A. Burch, Battle Creek, Mich.

MILWAUKEE SOCIETY OF ENGINEERS. Secretary, W. Fay Martin, 456 Broadway, Milwaukee, Wis.

MINNESOTA ELECTRICAL ASSOCIATION. Secretary-treasurer, Ludwig Kemper, Albert Lea, Minn. Second annual meeting, Nicollet Hotel, Minneapolis, Minn., March 18-19.

MISSISSIPPI ELECTRICAL ASSOCIATION. Secretary, J. Abbott, manager Jackson Electric Railway, Light and Power Company, Jackson, Miss.

MISSOURI ELECTRIC LIGHT, GAS AND STREET RAILWAY ASSOCIATION. Secretary, Claude L. Clary, Sikeston Electric Light and Power Company, Sikeston, Mo. Annual convention, Springfield, Mo., April 15-17.

MISSOURI INDEPENDENT TELEPHONE ASSOCIATION. Secretary, George W. Schwerer, Windsor, Mo.

MUNICIPAL LIGHTING ASSOCIATION OF MASSACHUSETTS. Secretary, J. C. Norcross, Hudson, Mass.

NATIONAL ARM, PIN AND BRACKET ASSOCIATION. Secretary, J. B. Magers, Madison, Ind.

NATIONAL ELECTRICAL CONTRACTORS' ASSOCIATION OF THE UNITED STATES. Secretary, W. H. Morton, 41 Martin Building, Utica, N. Y. Annual convention, Toledo, Ohio, July 21-23.

NATIONAL ELECTRICAL TRADES ASSOCIATION. Secretary, Frederic P. Vose, 1343 Marquette Building, Chicago, Ill.

NATIONAL ELECTRIC LIGHT ASSOCIATION. Secretary, John F. Gilchrist, Commonwealth Edison Company, Chicago, Ill. Annual convention, Atlantic City, N. J., June 1-4.

NEBRASKA ELECTRICAL ASSOCIATION. Secretary, William Bradford, Lincoln, Neb.

NEBRASKA INDEPENDENT TELEPHONE ASSOCIATION. Secretary, R. E. Mattison, Lincoln, Neb.

NEW ENGLAND ELECTRICAL TRADES ASSOCIATION. Secretary, Alton F. Tupper, 60 State Street, Boston, Mass.

NEW ENGLAND STREET RAILWAY CLUB. Secretary, John J. Lane, 12 Pearl Street, Boston, Mass. Meetings held on fourth Thursday of each month.

NEW YORK ELECTRICAL SOCIETY. Secretary, G. H. Guy, Engineering Societies Building, 29 West Thirty-ninth Street, New York city.

NEW YORK STATE INDEPENDENT TELEPHONE ASSOCIATION. Secretary, R. Max Eaton, Niagara Falls, N. Y.

NORTHWEST ELECTRIC LIGHT AND POWER ASSOCIATION. Secretary, N. W. Brockett, Cataract Building, Seattle, Wash.

NORTHWESTERN ELECTRICAL ASSOCIATION. Secretary-treasurer, John S. Allen, manager, Equitable Electric Light Company, Lake Geneva, Wis.

OHIO ELECTRIC LIGHT ASSOCIATION. Secretary, D. L. Gaskill, Greenville, Ohio. Annual convention, Toledo, Ohio, July 13-15.

OHIO INDEPENDENT TELEPHONE ASSOCIATION. Secretary, O. O. Welsheimer, Columbus, Ohio.

OHIO STREET RAILWAY ASSOCIATION. Secretary, Charles Currie, Akron, Ohio.

OKLAHOMA ELECTRIC LIGHT, RAILWAY AND GAS ASSOCIATION. Secretary, Galen Crow, Guthrie, Okla.

OLD-TIME TELEGRAPHERS' AND HISTORICAL ASSOCIATION. Secretary, Frank J. Scherrer, New York city.

ORDER OF THE REJUVENATED SONS OF JOVE. Mercury, C. B. Roulet, Dallas, Tex.

PACIFIC COAST ELECTRIC TRANSMISSION ASSOCIATION. Secretary, Samuel G. Reed, Portland, Ore.

PENNSYLVANIA ELECTRIC ASSOCIATION. Secretary, Dr. Henry M. Stein, Harrisburg, Pa.

PENNSYLVANIA STATE INDEPENDENT TELEPHONE ASSOCIATION. Secretary, H. E. Bradley, 135 South Second Street, Philadelphia, Pa.

PENNSYLVANIA STATE STREET RAILWAY ASSOCIATION. Secretary, Charles H. Smith, Lebanon, Pa.

PIKE'S PEAK POLYTECHNIC SOCIETY. Secretary, E. A. Sawyer, Colorado Springs, Colo. Meetings, second Saturday of each month.

RAILWAY SIGNAL ASSOCIATION. Secretary, C. C. Rosenberg, Bethlehem, Pa. Next annual meeting, Louisville, Ky., October 12-14, 1909.

SOCIETY OF WIRELESS TELEGRAPH ENGINEERS. Secretary, C. E. Russell, Boston, Mass.

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION. Secretary, Arthur L. Williston, Pratt Institute, Brooklyn, N. Y.

SOUTH DAKOTA INDEPENDENT TELEPHONE ASSOCIATION. Secretary-treasurer, E. R. Buck, Hudson, S. D.

SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION. Secretary, J. A. Myler, Jr., 608 Juanita Building, Dallas, Tex. Annual convention, Dallas, Tex., May.

STREET RAILWAY ASSOCIATION OF THE STATE OF NEW YORK. Secretary, J. H. Pardee, J. G. White & Company, New York city.

TEXAS INDEPENDENT TELEPHONE ASSOCIATION. Secretary, T. A. Gould, Ennis, Tex.

UNDERWRITERS' NATIONAL ELECTRIC ASSOCIATION. Secretary Electrical Committee, C. M. Goddard, 55 Kilby Street, Boston, Mass.

VERMONT AND NEW HAMPSHIRE INDEPENDENT TELEPHONE ASSOCIATION. Secretary-treasurer, E. B. Seeley, St. Johnsbury, Vt.

VERMONT ELECTRICAL ASSOCIATION. Secretary, C. C. Wells, Middlebury Electric Light Company, Middlebury, Vt.

VIRGINIA STATE INDEPENDENT TELEPHONE ASSOCIATION. Secretary, B. L. Fisher, Rocky Mount, Va.

WESTERN ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary, W. S. Boyd, 382 Ohio Street, Chicago, Ill.

WESTERN SOCIETY OF ENGINEERS (Electrical Section). Chairman, William B. Jackson, 115 Adams Street, Chicago, Ill.

WISCONSIN ELECTRIC AND INTERURBAN RAILWAY ASSOCIATION. Secretary, Clement C. Smith, president Columbia Construction Company, Milwaukee, Wis.

WISCONSIN INDEPENDENT TELEPHONE ASSOCIATION. Secretary, J. C. Crowley, Jr., Superior, Wis.

RECORD OF ELECTRICAL PATENTS.

Issued (United States Patent Office) March 2, 1909.

913,684. ELECTRIC BURGLAR ALARM. Alfred Bloch, Paris, France. Filed March 28, 1907. Below the carpet are laid a number of conducting wires whose circuits are closed when spring contact plates are stepped upon. The connections from the floor wires to the bell pass through lead tubes, so that if the wires are cut the alarm is also rung.

913,691. VARIABLE-SPEED MOTOR. James Burke, Erie, Pa., assignor to Burke Electric Company. Filed May 17, 1905. The armature has an additional winding for applying the line voltage to approximately one-half of the main winding.

913,718. SPACE TELEGRAPHY. Lee de Forest, New York, N. Y., assignor to De Forest Radio Telephone Company. Filed June 25, 1907. The system includes a source of practically continuous electrical oscillations of a frequency higher than the limit of audibility and means located in the earth connector for varying the oscillations in accordance with a simple harmonic law at a rate lower than the limit of audibility.

913,721. TROLLEY WHEEL. Joseph H. Giarth, Altoona, Pa. Filed April 14, 1908. The trolley wheel is hollow and contains a core, a wick within it, and a web having oppositely extending ducts for conveying lubricant to the wick.

913,734. TELEPHONY. Isidor Kitsee, Philadelphia, Pa., assignor of one-half to William J. Latta, Philadelphia, Pa. Filed November 22, 1905. A number of loading inductances are connected in series in the line circuit between stations, the cores for the inductances being normally and permanently magnetized independently of current transmitted over the line.

913,735. PROCESS OF EXTRACTING PRECIOUS METALS FROM ORES. Isidor Kitsee, Philadelphia, Pa. Filed May 23, 1908. The process of extracting gold consists in subjecting the ores to the dissolving action of a cyanide in the presence of the anolyte of an electric apparatus containing an oxide of nitrogen.

913,747. APPARATUS FOR ELECTROPLATING. Guy L. Meaker, Chicago, Ill., assignor to the Meaker Company, Chicago, Ill. Filed November 20, 1907. A tank contains the electrolyte, a cathode consisting of a tray for supporting the articles to be plated and mechanism for vibrating the tray.

913,753. LIGHT REGULATOR FOR ELECTRIC LAMPS. Thomas E. Murray, New York, N. Y. Filed January 23, 1907. Has a hollow cylinder of conducting material coaxially supported thereon and provided with indentations at one edge.

913,754. ELECTRIC-FUSE BOX. Thomas E. Murray, New York, N. Y. Filed March 19, 1908. The box is subdivided by partitions into three compartments, the two outer ones containing enclosed fuses.

913,755. ELECTRIC CUT-OUT. Thomas E. Murray, New York, N. Y. Filed September 2, 1908. The base has two sockets and circuit terminals, a removable fuse plug having its ends constructed to fit in the sockets and a receptacle for the plug ends when the plug is removed from the sockets.

913,757. ALTERNATING-CURRENT REGULATOR. Robert S. McLeod, Didsbury, Manchester, England. Filed October 22, 1906. An alternating-current machine has its rotor mechanically connected to a rotating mass and its rotatable case electrically connected to the mains, a motor being adapted to rotate the case.

913,782. ELECTRIC TRACTION ON THE SURFACE-CONTACT SYSTEM. Dawid Suchostauer, London, England. Filed March 5, 1908. A magnetized collector is carried by the car. A number of lengths of box-like structures are placed end to end in the track, each containing a conductor extending lengthwise through the box, metallic contact studs on the upper surface of the box and magnetically-operated switch arms to connect the contact studs with the electric conductor.

913,792. GERMICIDE LINING FOR MOUTHPIECES FOR VOICE-TRANSMITTING INSTRUMENTS. Augustus A. Williams, Charlotte, N. C. Filed July 14, 1908. A number of removable thin paper linings for a transmitter mouthpiece are combined in telescopic relation and each provided with means to prevent saliva from entering the transmitter.

913,795. TESTING SYSTEM FOR TELEPHONE LINES. Charles S. Winston, Chicago, Ill., assignor to Kellogg Switchboard and Supply Company, Chicago, Ill. Filed May 29, 1905. A busy-signal test for the operator's circuit is arranged so that a minimum voltage is employed in the test.

913,809. ELECTRIC SWITCH. Emory M. Carr, Newcastle, Ind. Filed March 14, 1908. A pair of conductors having adjacent portions imbedded in an insulator can be joined by a conductor, screw-threaded through one of the conductors and adapted to contact with the other within the insulator.

913,810. ELECTRICAL SWITCH. Thomas Clark and Ivan Vlasto, Stockton Heath, England. Filed December 14, 1907. A starting and controlling switch has a spindle with a number of spaced contact strips having ventilating spaces, a number of alternately-wound resistance coils being connected to and mounted between the strips.

913,814. MEANS FOR CONTROLLING DIRIGIBLE TORPEDOES. Levitt E. Custer, Dayton, Ohio. Filed July 23, 1906. A system of wireless telegraphy comprises a coherer, a single-tapping de-coherer, an auxiliary vibrating de-coherer engaging the coherer and adapted to create a series of vibrations in the same until the current is interrupted, and means whereby the two de-coherers are actuated when the coherer receives impulses from the transmitting station.

913,824. GALVANIC BATTERY. Baroukh Jonas, Toledo, Ohio, assignor to the Jonas Battery Company, Toledo, Ohio. Filed May 2, 1906. One electrode consists of an iron plate and an envelope composed of porous absorbent fabric secured to its surface. The other consists of granulated carbon and carbon rods, the electrolyte consisting of a deliquescent iron salt.

913,827. PROCESS OF PURIFYING WATER. Henry Korten, Chicago, Ill., assignor to Frederick Y. Nichols, Chicago, Ill. Filed December 9, 1907. Renewed December 24, 1908. Consists in subjecting the water to electrical action to change the soluble impurities to insoluble substances and then filtering through mercury.

913,831. SWIVEL FOR ELECTRICAL APPLIANCES. Abbot A. Low, Horseshoe, and Harry Hertzberg, New York, N. Y., assignors to Economy Electric Company, Brooklyn, N. Y. Filed May 4, 1907. Comprises two members capable of rotary movement with respect to each other and annular circuit contacts provided with ball bearings, the contacts cooperating to restrain the members from having endwise movement.

913,846. MIXED DRIVE FOR AUTO-VEHICLES. Henri Pieper, Liege, Belgium. Filed November 23, 1905. Comprises an engine, a dynamo, a storage battery, a motor and a manually-operated controller governing the set.

913,865. MULTIPLE-SWITCH STARTER. Henry J. Wiegand, Milwaukee, Wis., assignor to the Cutler-Hammer Manufacturing Company, Milwaukee, Wis. Filed May 20, 1907. There is provided an electro-responsive means for retaining all the switches in closed position, manually-operated means rendering the former normally operative, but inoperative if released before certain of the switches are closed.

913,888. ELECTRIC FURNACE. Paul L. T. Héroult, La Praz, France, assignor to Societe Electro-Metallurgique Francaise, Froges, Isère, France. Filed May 3, 1907. Has an electrode with its end in an enclosed space so as to be exposed to no gases except those formed immediately about it.

913,898. GALVANIC CELL. Baroukh Jonas, Toledo, Ohio, assignor to the Jonas Battery Company, Toledo, Ohio. Filed April 2, 1904. A series of porous jars is provided with a partial filling of iron particles and suspended silver ribbons connected by wire forming a negative terminal, a series of carbon plates connected by wire forming a positive terminal.

913,913. AUTOMATIC FUSE BLOCK. Charles O. Prowse, Hopkinsville, Ky. Filed September 25, 1907. A number of movable contact members are secured to a block, fuses being connected to the contact members and serving to normally hold them against movement; a contact member is slidably secured to the block and adapted to successively engage the movable members, a cable connecting a motor-actuated drum and the slidable contact member.

913,931. TELEPHONE TRANSMITTER. Charles Adams-Randall, New York, N. Y. Filed April 14, 1905. Has an elongated receptacle of narrow width and shallow depth and granular carbon in the receptacle, whose resistance is in the direction of its length rather than its depth.

913,936. ELECTRIC BATTERY. Lucien P. Basset, Enghien, France. Filed September 30, 1907. Contains two solutions, first a solution of sulphurous acid in sulphuric acid and, second, a solution of nitrous acid in sulphuric acid arranged to neutralize the first to form sulphuric acid and to cause the hydrogen ions to co-act with the second solution to form water and nitric oxide.

913,939. ELECTRICAL MEASURING INSTRUMENT. Joshua F. Begole, St. Louis, Mo., assignor to Wagner Electric Manufacturing Company, St. Louis, Mo. Filed February 10, 1908. The instrument is arranged so it may be operated either as a voltmeter or as a wattmeter.

913,941. IONIZER OR APPARATUS FOR PRODUCING GASEOUS IONS. Lucien I. Blake, Denver, Colo. Filed November 17, 1908. The ionizer is composed of glass wool in an electric field.

913,944. TELEPHONE TRANSMITTER. Henry P. Clausen, Chicago, Ill., assignor to the American Electric Telephone Company, Chicago, Ill. Filed July 9, 1904. A vibratory-front electrode is connected with the main diaphragm; a stationary back electrode is connected with a bridge, there being granular carbon between the two electrodes and resilient back and front auxiliary diaphragms clamped to the respective electrodes.

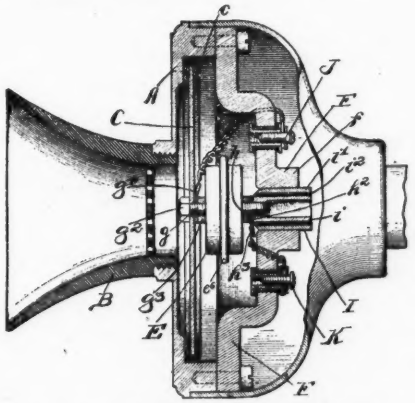
913,947. TELEPHONE MOUTHPIECE. William Gibson, Danbury, Conn., assignor to the Gibson Manufacturing Company, Danbury, Conn. Filed April 20, 1908. The telephone mouthpiece is of glass and is combined with a cup-like shell inserted into its inner end.

913,966. SUCTION CLEANER. Otto H. Mohr, San Francisco, Cal., assignor to Fiege-Mohr Electric Appliance Company, San Francisco, Cal. Filed May 9, 1908. The suction pump is driven by an electric motor.

913,974. ELECTRIC SEMAPHORE SIGNAL. George W. Pettey, Alexandria, Va., assignor to Pettey Electrical Indicator Signal Company, Alexandria, Va. Filed September 21, 1908. Contains an electro-mechanical motor mechanism and two opposite hollow radiating arms bearing at their outer ends electric-light boxes.

913,999. MULTIPLE-SWITCH STARTER. Henry J. Wiegand, Milwaukee, Wis., assignor to the Cutler-Hammer Manufacturing Company, Milwaukee, Wis. Filed May 20, 1907. Renewed January 11, 1909. This is a modification of No. 913,865.

914,038. BATTERY CONTACT. Julius H. Gugler, Minneapolis, Minn., assignor to Battery Company. Filed February 21, 1908. A carbon-battery electrode has formed in its upper extremity a well, the walls of which are electroplated with copper and which contains mercury.



913,944.—TELEPHONE TRANSMITTER.

914,042. GUARD FOR THE ARMS OF ELECTRIC-CONDUCTOR SUPPORTS. George E. Harrison and George Burns, Detroit, Mich. Filed May 25, 1908. A guard for linemen's use comprises a tread part of insulating material provided with notches at its ends and hanging side members connected therewith and provided with inturned flanges.

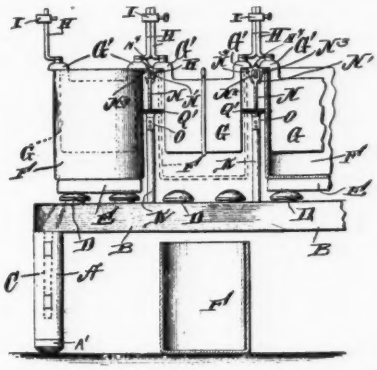
914,043. SAFETY FUSE. Gerald W. Hart and Frank D. Reynolds, Hartford, Conn., assignors to the Sachs Company, Hartford, Conn. Filed July 28, 1906. A tubular casing is provided with a longitudinal slit in its surface for its entire length which contains a wire and indicating means connected to the terminals of the fuse.

914,045. CORD CONNECTOR AND RACK. William E. Hill, Lagrange, Ill., assignor to Kellogg Switchboard and Supply Company, Chicago, Ill. Filed January 12, 1907. A telephone cord rack consists of a longitudinal support, clamps movably mounted thereon and insulated cord connectors carried by the clamps.

914,046. COOLING DEVICE FOR THE ROTARY MEMBERS OF ELECTRIC MACHINES. Jackobus Hissink, Berlin, Germany, assignor to Bergmann Elektricitäts-Werke Aktiengesellschaft, Berlin, Germany. Filed October 23, 1907. Comprises two spaced annular members, one of which surrounds the other, wires extending between the members and a carrier engaged by the inner member and provided with ventilating channels adjacent thereto.

914,064. SIGN. Christie S. Neville, Chicago, Ill. Filed October 9, 1908. In front of the middle of each side of the circular sign is supported a reflector to throw on the sign the rays from an electric lamp mounted in a central aperture.

914,094. ELECTRICAL CONTROLLING DEVICE. John T. Whalen, Brooklyn, N. Y. Filed June 27, 1907. Combined with a fuel-supply pipe and a damper revolubly mounted therein on a spindle, together with the armatures of electromagnets, are means for successively energizing the armatures to obtain a multiple-step throttling motion of the damper.



914,301.—SUPPORT FOR STORAGE-BATTERY ELEMENTS.

914,100. ELECTROLYTIC PROCESS OF PRODUCING COMPOUNDS. Charles E. Acker, Niagara Falls, N. Y. Filed March 6, 1907. Renewed July 27, 1908. The process of producing cyanogen compounds consists in continuously electrolyzing a molten, metallic compound, alloying the separated metal with a cathode metal, removing the alloy and reacting on the alloyed metal with nitrogenous and carbonaceous reagents.

914,107. WALL PLATE FOR ELECTRIC FIXTURES. Ignatius Bond, Evanston, Ill. Filed March 9, 1908. Consists of a plate the central portion of which is raised and has an opening therein, lugs projecting inward and a cross-bar located between the lugs and opening and bridging the space back of the opening.

914,172 and 914,173. ELECTRIC ALARM. Theodor Norpoth, St. Louis, Mo. Filed June 12 and September 28, 1908. Comprises an annunciator in a normally open circuit and a supplemental circuit co-operating therewith.

914,177. SYSTEM FOR CONTROLLING THE STRENGTH OF DIRECT CURRENTS IN ELECTRICAL CIRCUITS. Menahem M. Osnos, Frankfort-on-the-Main, Germany, assignor to the firm of Felten & Guilleaume-Lahmeyer-Werke Actien-Gesellschaft, Frankfort-on-the-Main, Germany. Filed October 29, 1907. Comprises a motor-generator set, the motor of which is connected to the supply circuit and has a number of auxiliary field windings.

914,190. LAMP GUARD. William T. Russell, Wellesley, Mass. Filed January 16, 1908. Consists of a wire cage with a hinged circular end guard adapted to be locked in place.

914,194. ANTISEPTIC LINING FOR MOUTHPIECES. George M. Scroggs, New Orleans, La. Filed December 26, 1908. Comprises an outer member, an inner member arranged in and detachably connected to it and antiseptic means interposed and held between the two members.

914,207. TROLLEY FROG AND CROSSING. Frank J. Venning, Pittsburg, Pa. Filed April 15, 1908. Has a pan and a wearing plate detachably secured to the lower face of the pan.

914,214. ELECTROLYTIC PROCESS OF PRODUCING NITROGEN COMPOUNDS. Charles E. Acker, Niagara Falls, N. Y. Filed October 8, 1906. This is a modification of No. 914,100.

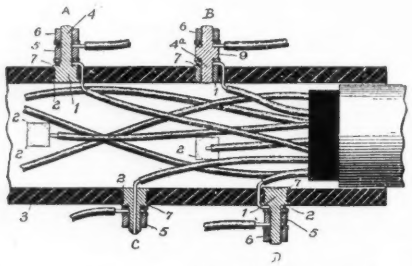
914,229. ADVERTISING CLOCK. John B. Barnett, Fort Worth, Tex., assignor of one-half to George S. Hart, Fort Worth, Tex. Filed March 11, 1908. Between two superposed sprockets is a novel sprocket chain; the sprockets as well as the clock are operated by electromagnets.

914,235. SIGNAL. Claude N. Brown, Richmondville, N. Y. Filed January 14, 1908. A series of display cards are concealed by shutters, each one of which can be released by an electromagnet.

914,251. PROCESS OF CHLORINATING ORGANIC BODIES. Carleton Ellis, White Plains, N. Y., and Karl P. McElroy, Washington, D. C., assignors to Fireproof Products Company.

Filed January 12, 1906. Renewed October 6, 1908. Consists in electrolyzing a chloride and causing the evolved chlorine to react upon naphthalene.

914,301. STORAGE-BATTERY STAND AND MEANS FOR RAISING AND SUPPORTING PLATES, ETC. Otto H. Nelson, Highland Falls, N. Y., assignor of one-fourth to Alexander C. Cornelison, Highland Falls, N. Y. Filed October 16, 1908. An apparatus for holding storage-battery plates for convenience in cleaning the cells comprises a stand and means for raising the plates slightly free from the cell to permit the cell to be lowered and freely removed from the stand.

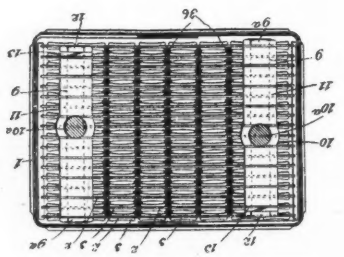


914,327.—BINDING-POST CONSTRUCTION.

914,305. CAR HEATER. Edgar J. Rauch, Taunton, Mass. Filed October 1, 1907. An electric car has water pipes, tanks from which the pipes lead, motor-resistance coils located within the tanks, a second set of similar coils located outside the tanks, and means for diverting the motor current into either or both sets of coils.

914,311. ELECTRIC-CURRENT GENERATOR. Charles C. Ruprecht, Cleveland, Ohio, assignor to Ruprecht Electrical Company, Cleveland, Ohio. Filed July 28, 1905. An inductor-type alternating-current magneto has a fixed inducing winding in the recesses between the pole pieces and a rotary inductor within the winding.

914,327. BINDING POST. Charles Barbour, Pittsburg, Pa., assignor to Standard Underground Cable Company, Pittsburg, Pa. Filed May 16, 1908. Consists of a body provided at one end with an angular locking portion and at the opposite end with a thin peripheral wall and a threaded stem.



914,342.—EDISON STORAGE BATTERY.

914,338. TROLLEY HARP OR POLE. William A. Dechant, Columbus, Ohio. Filed August 6, 1908. Comprises a pole having upwardly extending arms, a roll extending transversely between them for engaging the trolley wire and a fixed guide extending longitudinally between the arms beneath the roll.

914,342. STORAGE BATTERY. Thomas A. Edison, Llewellyn Park, Orange, N. J., assignor to Edison Storage Battery Company, West Orange, N. J. Original application filed November 28, 1902. Divided and this application filed December 7, 1905. Combined with two sets of grids carrying pockets containing active materials are vertical separator rods of insulating material situated between the grids, each rod engaging four adjacent pockets.

914,343. PROCESS OF MAKING STORAGE-BATTERY ELECTRODES. Thomas A. Edison, Llewellyn Park, Orange, N. J., assignor to Edison Storage Battery Company, West Orange, N. J. Original application filed March 30, 1905. Divided and this application filed May 17, 1907. Consists in coating granular material with conducting metallic films, compressing the mass to secure coherence and in subjecting the films to a welding temperature in a hydrogen atmosphere.

914,346. METHOD OF OPERATING ELECTRIC FURNACES. Paul L. T. Héroult, La Praz, France, assignor to Societe Electro-Metallurgique Francaise, Froges, Isère, France. Original application filed May 3, 1907. Divided and this application filed November 13, 1908. Consists in feeding the charge so as to present an inclined face to an electrode and shifting the inclined face toward and from the electrode to vary the resistance.

914,354. FILAMENT FOR ELECTRIC GLOW LAMPS. Hans Kuzel, Baden, Austria-Hungary. Filed March 23, 1906. Consists of an alloy of tungsten with antimony.

914,355, 914,356 and 914,357. ELECTRIC-CIRCUIT CONTROLLER. Harry W. Leonard, Bronxville, N. Y. Original application filed November 30, 1901. Divided and these applications filed April 6, 1906. Electrically connected with the starting arm of a motor starter is a circuit-breaker of various forms that opens the motor circuit on overload, on too rapid a movement of the arm, or on a retrograde movement thereof.

914,365. SYSTEM FOR THE DISTRIBUTION OF ELECTRIC POWER FOR TRACTION PURPOSES. Roy A. Weagant, Derby Line, Vt., assignor of one-fiftieth to Jerome T. Flint and two fiftieths to Annie G. Flint, Derby Line, Vt., and two-fiftieths to Robert J. Meekren, Stanstead, Canada. Filed June 8, 1906. Means actuated by the auxiliary circuit are adapted to close the direct circuit, a switch in the former being adapted to be opened by the impact of the falling core of a solenoid in the direct circuit when this is interrupted.

914,368. PROCESS OF FREEING RAW WOOL FROM ITS YOLK AND GREASE BY ELECTRICAL MEANS. Joseph M. Baudot, Tourcoing, France. Filed June 8, 1906. Consists in bringing the raw wool into a bath and there subjecting it to the electrolytic action of a current of comparatively low voltage to eliminate its suint, grease and yolk.

914,372. PROCESS FOR MAKING THIN METALLIC FLAKES. Thomas A. Edison, Llewellyn Park, Orange, N. J., assignor to Edison Storage Battery Company, West Orange, N. J. Original application filed March 30, 1905. Divided and this application filed July 14, 1906. Consists in obtaining granules composed of cobalt and nickel, each in form of an integral sponge-like structure, intimately engaging together to form a continuous solid mass, subjecting the granules to successive rolling operations and annealing the same in a gas which does not react thereupon after one or more of the rolling operations.

PATENTS THAT HAVE EXPIRED.

Following is a list of electrical patents (issued by the United States Patent Office) that expired March 8, 1909:

470,194. ELECTRIC MOTOR OR DYNAMO-ELECTRIC MACHINE. H. H. Hosford, Cleveland, Ohio.

470,199. ELECTRIC MOTOR OR GENERATOR. R. Kennedy, Glasgow, Scotland.

470,217. CONNECTION FOR ARMATURE CONDUCTORS. G. Stephens, Lynn, Mass.

470,221. ELECTRIC RAILWAY. E. Thomson, Lynn, Mass.

470,231. FIRE-ALARM AND TELEPHONE APPARATUS. E. H. Ames, Chicago, Ill.

470,260. ELECTRIC BATTERY. V. Riatti, Milan, Italy.

470,294. ELECTRICAL ATTACHMENT FOR PIANOS. F. A. Feldkamp, Newark, N. J.

470,340. MOVABLE COIL FOR ELECTRICAL MEASURING INSTRUMENTS. E. Weston, Newark, N. J.

470,341. ELECTRICAL MEASURING INSTRUMENT. E. Weston, Newark, N. J.

470,356. INSULATOR FOR OVERHEAD ELECTRIC RAILWAYS. H. D. Winton, Wellesley, Mass.

470,428. ELECTRIC STORE-SERVICE APPARATUS. M. W. Hassan, Rochester, N. Y.

470,441. ELECTRIC-CURRENT METER. J. W. T. Olan, New York, N. Y.

470,471. INCANDESCENT ELECTRIC LAMP. A. C. Carey, Lake Pleasant, Mass.

470,505. ELECTRIC CAR BRAKE. J. Redmond, Seattle, Wash.

470,516. ELECTRIC LOCOMOTIVE. E. A. Sperry, Chicago, Ill.

470,521. ELECTRIC GENERATOR. C. J. Van Depoele, Chicago, Ill.

470,552. GALVANIC BATTERY. J. H. Davis, Detroit, Mich.

470,557. TELEGRAPH RELAY. C. M. Dyer, Cloverdale, Ind.

470,596. ELECTRIC CIRCUIT CLOSER. G. W. Price, Baltimore, Md.

470,634. TELEPHONE. W. A. West, Bellefontaine, Ohio.

470,638. ELECTRIC SEARCHLIGHT. R. S. Dobbie, Brooklyn, N. Y.